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CONSTABLE'S MISCELLANY

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IN THE VARIOUS DEPARTMENTS

— OF —

LITERATURE SCIENCE, & THE ARTS,

VOL. XII.

REMARKABLE PHENOMENA OF NATURE

THE SALT LAKE OF LOONAR. *See Page 137*

EDINBURGH:

PRINTED FOR CONSTABLE & Cº

1827.

Biol
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SELECTIONS

OF THE

MOST REMARKABLE

PHENOMENA OF NATURE.

EDITED BY

HENRY G. BELL, Esq.

Bassford
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EDINBURGH:
PRINTED FOR CONSTABLE AND CO.
AND
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1827.

PREFACE.

In one sense, every atom of existing matter affords a theme for wonder; in another, nothing does. Man may be considered either as knowing so much, that he cannot fail to be astonished with every thing; or so little, that he is incapable of appreciating the strangeness of any thing. Disregarding, however, the wranglings both of the sophist and the sceptic, of the would-be-wise, and the affectedly ignorant, we shall form a correcter estimate of the human mind, by avoiding either extreme, and ascribing to it a medium power. There can be little question that our ideas of the wonderful are relative, depending upon the strength and cultivation of the understanding. The child looks with surprise on the simplest toy, whilst the philosopher sees nothing but what is at once natural and necessary in the revolution of systems.

There are certain known and fixed laws by which all the operations of Nature are carried on; and even in those instances (and they are not few) in which the causes and modes of action of these laws are con-

cealed from us, their general results are invariably found to be the same. These results may be divided into two classes;—the one, so common, and rendered so familiar to us by every day occurrence, that, though in reality not one whit less remarkable than any of the coincidences arising out of the agency of universal nature, they are to us less the subject of speculation and uncertainty;—the other, occurring at longer intervals, or more thinly scattered over the surface of the globe, afford fewer opportunities for ordinary investigation, and, having their peculiar features consequently more involved in obscurity, are better calculated to excite wonder, and awaken curiosity.

It is to these appearances in nature that mankind usually apply the term *Phenomena.* This word means simply any thing that arrests attention by its novelty. If any of the productions of nature be, literally and philosophically speaking, *wonderful*—that is to say, deserving of exciting admiration by the ingenuity and power evinced in their construction—it is not to be doubted, that the commonest weed or insect we trample on affords as just a reason for this emotion, as the Leviathans of the deep, or the mighty orb itself, hung out as a lamp upon the battlements of heaven. But weeds and insects are familiar to us; and their very multitude (which is only another reason why we should wonder the more) contributes not

a little towards the indifference with which we regard them. The abysses of the unfathomed ocean, on the contrary—the dark caverns and stupendous mountains of the far extended earth—and the suns, stars, planets, and systems of illimitable space—are subjects, for information concerning which we must be indebted to the rare and adventurous traveller over the lonely places of the globe, or to the still rarer and more adventurous mind, that goes forth on a voyage of discovery through the trackless realms of infinity. The multitude, busied with the petty concerns of artificial life, must be content to wait their return, and divide among them the stores of information that have been gathered by others. And it is well that we have even this resource; for benevolent Nature has wisely implanted in us an insatiable desire for knowledge, by the operation of which principle alone can our nobler and better part be cultivated, and rendered worthy its destiny.

The object the present Volume aims at accomplishing, is to put into the reader's possession as judicious, interesting, and useful a Selection of some of the more remarkable Phenomena of Nature, as it was in the Editor's power to make. Perhaps the title *Phenomena of Nature*, is too comprehensive and aspiring. Man's knowledge, if we except a few vague conclusions he has come to concerning the Heavenly Bodies, extends

not beyond this earth. If Nature exhibits phenomena here, the number and varieties of which are infinitely beyond our powers of counting or explaining, what may she not be supposed to have done in other worlds and other systems, which are extended every where! Even when we limit our regard to this planet, minute and insignificant as it is amongst the millions which we know to exist, how soon do the resources of our intellect fail to carry us through the doubts and difficulties which surround us! Man in a populous city, comparing himself with his fellow-men, and living among the works of his own hands, may possibly be entitled to hold his head erect, and feel proudly conscious that he is endowed with the energies, and not unacquainted with the duties, necessary for the discharge of social life. But man among the primeval mountains, in the solitary forest, or uncultivated wild, finds himself sunk into insignificance. There, he stands in the immediate presence of majestic Nature, who, for a long series of ages, has been carrying on operations in the calm silence of omnipotent power, that but too forcibly illustrate the nothingness of his most vaunted works. Yet the lesson thus taught is not the less valuable. The mind, though lost in the labyrinth of its own thoughts, is elevated and enlarged by the contemplation of mysteries so sublime; and though its conclusions may be but as those of

a splendid revery, still it is not unlikely that the time will arrive, when we shall find that these first dawnings of uncertain light were the precursors of the full and glorious blaze of day. Nor even in this world are such studies and contemplations without their reward. They teach us the worthlessness of those short-lived pleasures that surround us here, and the folly of summoning in array a thousand evil passions, for the purpose of obtaining them; they take not from the interest or the value of life, by sweeping away many of those delusions to which we may have too fondly clung, for they inspire, in their place, far loftier thoughts —far nobler aims—and far better hopes; —they tranquillize the mind,—they soften the heart,—they give purity and strength to the affections.

In collecting materials for our work, we are not aware that we have proceeded upon any peculiar or uncommon principle. Our desire was, of course, to be neither too scientific and exclusive, nor too trite and general. To expect in one volume, however large, a well arranged collection of *all* that might be supposed to interest in the material universe, would be like imagining that the world might be wrapt up in a single leaf. If it can be said with truth of the present volume, that some things are to be found in it which perhaps the reader did not expect to find, but the interest of which

he confesses upon perusal, we shall not so much regret that many things are necessarily absent which may be usually met with in books of a similar kind. The talent required to make a mere selection, is at all times of an inferior order, although it cannot be disputed that the task is one which requires the exercise of judgment; and according to the extent of the selector's endowments in this respect, will be the merits of his selection. For ourselves, claiming as we do no praise but that of a compiler, we think it at the same time proper to state, that we have invariably made it a rule to consult the author from whom we quote; and that we have in scarcely one instance been indebted for our extracts to previous collections of a similar kind. It does not however follow, that we have made selections which have never been made before; though we trust the contents of our Volume possess a good deal of freshness and novelty. A few Notes, we may add, have been introduced, which serve occasionally to illustrate the text.

We have divided our subject into three heads. The first embraces *Terrestrial Phenomena*, which are naturally classed under *Inanimate* and *Animate*. The second relates to *Marine;* and the third to *Celestial Phenomena*. Of these, the first division is the largest and most important, because it is that with which we are most conversant, and

from the facts contained in which we are able to reason with most certainty. These reasonings, indeed, are commonly nothing else but the building of theories, which, however excellent they may be, comprehend a different department in the history of intellect, and, from the inadequate data upon which they are founded, must always end more or less unsatisfactorily. There is, for example, a stumbling-block which presents itself at the very outset, and to get over which has exercised the ingenuity of philosophers from the earliest period of their labours. It is, to account for the shape, formation, and external appearance of the material world. It would be somewhat difficult to compute the number of crude and almost self-evident absurdities which have been gravely advanced, under the mask of Philosophy, upon this interesting subject. One ancient sect taught, that the globe was a living animal; another, that the earth was a plain tablet resting upon air, and that the stars were fiery substances fixed in the heavens, like nails in a crystalline plane. In later times it has been maintained, that this world was created by the atmosphere of one comet, and deluged by the playful tail of another. What is precisely meant by this supposition, it might probably puzzle Whiston himself, who first suggested it, to explain. Leibnitz and Des Cartes agree in supposing the world to be an extinguished

sun; whilst others adhere to the still more fanciful theory of Kepler, whose notions, that the earth possesses a vital fluid, and that the minutest of its particles are endowed with instinct and volition, acting upon each other according to sympathies and antipathies, are well adapted to amuse and captivate a lively imagination. Newton, Buffon, and Cuvier have probably arrived a little nearer the truth, though it is not to be doubted that, in the systems of all these philosophers, much error is intermingled.

Without wishing, then, to depreciate the value of these laborious speculations, we cannot help thinking it better, that the generality of mankind should avoid entering upon them. To those unpossessed with strong mental endowments, they must ever prove dangerous and unprofitable; and even the wisest will find themselves able only to make darkness visible. We may discover what causes the eruption of a volcano, but why the volcano itself exists, is known only to the Deity. A certain length we can go, but no further; we may ascertain that which is, but we can never discover why that which is should have been. "The distance between heaven and earth," as some one has well remarked, "is itself not so great as that which divides the Creator from the created." Reason is a ladder with which we can climb but a short way up the tree of knowledge.

In the following pages, therefore, avoiding all diffuse and theoretical speculations, we have chosen, as the more profitable course, to confine ourselves to facts. We have always quoted our authorities; but, wherever we found it advisable, we did not scruple to abridge and condense them;—indeed, we were at some pains with most of our authors to do this, in order to include them more conveniently within our limits. We are not aware that the volume contains any thing fabulous, or even uncertain; and whether our extracts be from works of science, collections of voyages and travels, or curious and, perhaps, somewhat rare books, we are pretty confident that the subject-matter of all of them is worthy of implicit belief.

Our labours, in putting our materials together, have not been unattended with gratification and instruction; and though, from the plan we pursued, we were of course obliged to reject far the greater portion of what we read, we shall be much more than compensated for this voluntary trouble, if what we *have* chosen be considered likely to afford useful information, and moral as well as intellectual amusement to our numerous readers.

HENRY G. BELL.

Edinburgh, August 1827.

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SELECTIONS

OF

THE MOST REMARKABLE

PHENOMENA OF NATURE.

PART FIRST—TERRESTRIAL.

PHENOMENA OF NATURE.

PART FIRST—TERRESTRIAL.

I. INANIMATE.

GENERAL VIEW OF THE EARTH.

The surface of this immense globe exhibits to our observation, heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes; and, on a cursory view, we can discover, in the disposition of these objects, neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, stones, bitumens, sands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent design. Upon a nearer and more attentive inspection, we discover sunk mountains, caverns filled up, shattered rocks, whole countries swallowed up, new islands emerged from the ocean, heavy substances

placed above light ones, hard bodies enclosed within soft bodies; in a word, we find matter in every form, dry and humid, warm and cold, solid and brittle, blended in a chaos of confusion, which can be compared to nothing but a heap of rubbish, or the ruins of a world.

These ruins, however, we inhabit with perfect security. The different generations of men, of animals, and of plants, succeed one another without interruption. The productions of the earth are sufficient for their sustenance; the motions of the sea and the currents of the air, are regulated by fixed laws; the returns of the seasons are uniform; and the rigours of winter invariably give place to the verdure of the spring. With regard to us, every thing has the appearance of order. The earth, formerly a chaos, is now a tranquil, an harmonious, a delightful habitation, where all is animated and governed by such amazing displays of power and intelligence as fill us with admiration, and elevate our minds to the contemplation of the great Creator.

But, let us not decide precipitantly concerning the irregularities on the surface of the earth, and the apparent disorder in its bowels. We shall soon perceive the utility, and even the necessity of this arrangement. With a little attention, we shall perhaps discover an order of which we had no conception, and general relations which cannot be apprehended by a slight examination. Our knowledge, indeed, with regard to this subject, must always be limited. We are entirely unacquainted with many parts of the surface of this globe, and have but very partial ideas concerning the bottom

of the ocean, which, in many places, has never been sounded. We can only penetrate the rind of the earth. The greatest caverns, the deepest mines, descend not above the eight thousandth part of its diameter. Our judgment is therefore confined to the upper stratum, or mere superficial part. We know indeed, that, bulk for bulk, the earth is four times heavier than the sun. We likewise know the proportion its weight bears to that of the other planets. But still this estimation is only relative. We have no standard. Of the real weight of the materials we are so ignorant, that the internal part of the globe may be either a void space, or it may be composed of matter a thousand times heavier than gold. Neither is there any method of making further discoveries on this subject. It is even with difficulty that rational conjectures can be formed.

We must, therefore, confine ourselves to an accurate examination and description of the surface of the earth, and of such inconsiderable depths as we have been able to penetrate. The first object which attracts the attention is, that immense body of water with which the greatest part of the globe is covered. These waters occupy the lowest grounds; their surface is always level; and, notwithstanding their uniform tendency to equilibrium and rest, they are kept in perpetual agitation by a powerful agent, which counteracts their natural tranquillity, which communicates to them a regular periodic motion, alternately elevating and depressing their waves, and which produces a concussion or vibration in the whole mass, even to the most profound depths. This motion of the water

is coeval with time, and will endure as long as the sun and moon, which are the causes of it.

In examining the bottom of the sea, we perceive it to be equally irregular as the surface of the dry land. We discover hills and valleys, plains and hollows, rocks and earths of every kind. We discover likewise that islands are nothing but the summits of vast mountains, whose foundations are buried in the ocean. We find other mountains whose tops are nearly on a level with the surface of the water; and rapid currents which run contrary to the general movement. These currents sometimes run in the same direction; at other times their motion is retrograde; but they never exceed their natural limits, which seem to be as immutable as those which bound the efforts of land-rivers. On one hand, we meet with tempestuous regions, where the winds blow with irresistible fury, where the heavens and the ocean, equally convulsed, are mixed and confounded in the general shock; violent intestine motions, tumultuous swellings, waterspouts, and strange agitations produced by volcanoes, whose mouths, though many fathoms below the surface, vomit forth torrents of fire, and push, even to the clouds, a thick vapour, composed of water, sulphur, and bitumen; and dreadful gulfs or whirlpools, which seem to attract vessels for no other purpose than to swallow them up. On the other hand, we discover vast regions of an opposite nature, always smooth and calm, but equally dangerous to the mariner. Here the winds never exert their force; the nautical art is of no utility; the becalmed voyagers must remain immoveably fixed, till death relieve them from misery. To conclude, direct-

ing our eyes toward the southern or northern extremities of the globe, we discover huge masses of ice, which, detaching themselves from the polar regions, advance, like floating mountains, to the temperate climates, where they dissolve and vanish from our view.

Besides these grand objects, the ocean presents us with myriads of animated beings, almost infinite in variety. Some, clothed in light scales, swim with amazing swiftness; others, loaded with thick shells, trail heavily along, leaving their traces in the sand. To others, nature has given fins resembling wings, with which they support themselves in the air, and fly before their enemies to considerable distances. Lastly, the sea gives birth to other animals, that, totally deprived of motion, live and die immoveably fixed to the same rocks. All, however, find abundance of food in this fluid element. The bottom of the ocean, and the shelving sides of rocks, produce plentiful crops of plants of many different species. Its soil is composed of sand, gravel, rocks, and shells. In some places, it is a fine clay, in others a compact earth; and, in general, the bottom of the sea has an exact resemblance to the dry land which we inhabit.

Let us next take a view of the land. What prodigious differences take place in different places! What a variety of soils! What inequalities in the surface! But, upon a more attentive observation we will perceive, that the great chains of mountains lie nearer the Equator than the Poles; that, in the Old Continent, their direction is more from east to west, than from south to north; and

that, on the contrary, in the New Continent, they extend more from north to south, than from east to west. But, what is still more remarkable, the figure and direction of these mountains, which have a most irregular appearance, correspond so wonderfully, that the *prominent* angles of one mountain are constantly opposite to the *concave* angles of the neighbouring mountain, and of equal dimensions, whether they be separated by an extensive plain, or a small valley. I have further remarked, that opposite hills are always nearly of the same height; and that mountains generally occupy the middle of continents, islands, and promontories, dividing them by their greatest lengths. I have likewise traced the courses of the principal rivers, and find that their direction is nearly perpendicular to the sea-coasts into which they empty themselves, and that, during the greatest part of their courses, they follow the direction of the mountains from which they derive their origin. The sea-coasts are generally bordered with rocks of marble and other hard stones, or rather with earth and sand accumulated by the waters of the sea, or brought down and deposited by rivers. In opposite coasts, separated only by small arms of the sea, the different strata or beds of earth are of the same materials. I find that volcanoes never exist, but in high mountains; that a great number of them are entirely extinguished; that some are connected to others by subterranean passages, and their eruptions not unfrequently happen at the same time. There are similar communications between certain lakes and seas. Some rivers suddenly disappear, and seem to precipitate themselves into the bowels of the earth. We like-

wise find certain mediterranean or inland seas, that constantly receive, from many and great rivers, prodigious quantities of water, without any augmentation of their bounds, probably discharging, by subterraneous passages, all those extraneous supplies. It is likewise easy to distinguish lands which have been long inhabited, from those new countries where the earth appears in a rude state, where the rivers are full of cataracts, where the land is either nearly overflowed with water, or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

Proceeding in our examination, we discover that the upper stratum of the earth is universally the same substance; that this substance, from which all animals and vegetables derive their growth and nourishment, is nothing but a composition of the decayed parts of animal and vegetable bodies, reduced into such small particles, that their former organic state is not distinguishable. Penetrating a little deeper, we find the real earth, beds of sand, limestone, clay, shells, marble, gravel, chalk, &c. These beds are always parallel to each other, and of the same thickness through their whole extent. In neighbouring hills, beds or strata of the same materials are uniformly found at the same levels, though the hills be separated by deep and large valleys. Strata of every kind, even of the most solid rocks, are uniformly divided by perpendicular fissures. Shells, skeletons of fishes, marine plants, &c. are often found in the bowels of the earth, and on the top of mountains, even at the greatest distances from the sea. These shells, fishes, and plants, are exactly similar to those

which exist in the ocean. Petrified shells are to be met with almost every where in prodigious quantities. They are not only enclosed in rocks of marble and limestone, as well as in earths and clays, but are actually incorporated and filled with the very substances in which they are enclosed. In fine, I am convinced by repeated observation, that marbles, limestones, chalks, marls, clays, sand, and almost all terrestrial substances, wherever situated, are full of shells and other spoils of the ocean.—*Buffon's Natural History.*

REASONS FOR BELIEVING THAT GREAT REVOLUTIONS HAVE TAKEN PLACE IN THE EXTERNAL CRUST OF THE GLOBE.

I AM of opinion, that, if there is any circumstance thoroughly established in geology, it is, that the crust of our globe has been subjected to a great and sudden revolution, the epoch of which cannot be dated much farther back than five or six thousand years ago; that this revolution had buried all the countries which were before inhabited by men, and by the other animals that are now best known; that the same revolution had laid dry the bed of the last ocean, which now forms all the countries at present inhabited; that the small number of individuals of men and other animals that escaped from the effects of that sudden revolution, have since propagated, and spread over the lands then newly laid dry; and, consequently, that the human race has only resumed a progressive state of improvement since that epoch, by forming esta-

blished societies, raising monuments, collecting natural facts, and constructing systems of science and of learning.

Yet farther, that the countries which are now inhabited, and which were laid dry by this last revolution, had been formerly inhabited at a more remote era, if not by man, at least by land animals; that, consequently, at least one previous revolution had submerged them under the waters; and that, judging from the different orders of animals of which we discover the remains in a fossil state, they had probably experienced two or three irruptions of the sea.

These alternate revolutious form, in my opinion, the problem in geology that is most important to be solved, or rather to be accurately defined and circumscribed; for, in order to solve it satisfactorily and entirely, it were requisite that we should discover the cause of these events—an enterprise involving difficulties of a very different nature.

We are able to discover with sufficient precision all that takes place on the surface of our world in its present state, and we have sufficiently ascertained the uniform progress and regular successions of the primitive formations; but the study of the secondary formations is as yet scarcely commenced. The wonderful series of unknown marine moluscae and zoophites, followed by fossil remains of serpents and of fresh-water fish equally unknown, which are again succeeded by other moluscae and zoophites more nearly allied to those which exist at present—all these land animals, these moluscae, and other unknown animals of fresh-water, which next occupy the formations, and which are finally succeeded by other moluscae,

and other animals resembling those of our present seas; the relations between these various animals and the plants whose remains are mixed among them, and the relations of both with the mineral strata in which they are imbedded; the little resemblance between these extraneous fossils of animals and plants, as contained in the different basins of former waters:—all these form a series of phenomena, which imperiously demands the attention of philosophers.

This study is rendered interesting, by the variety of productions of partial or general revolutions which it affords, and by the abundance of the different species which alternately offer themselves to view. It neither has that dull monotony which attaches to the study of the primitive formations, nor does it force us, like the latter, almost necessarily into hypotheses. The facts with which it is conversant are so prominent, so curious, and so obvious, that they may suffice to occupy the most ardent imagination; and the conclusions which they afford, from time to time, even to the most cautious observer, have nothing vague or arbitrary in their nature. Finally, by the careful investigation of these events, which approach, as it were, to the history of our own race, we may hope to be able to discover some traces of more ancient events, and their causes; if, after so many abortive attempts already made, on the same subject, we may yet flatter ourselves with that hope.—*Cuvier on the Theory of the Earth.*

MOUNTAINS.

ALTHOUGH the earth, at the distance of Venus, or even at the smaller distance of the moon, would appear to be a perfect sphere, yet those bodies, when examined with a telescope, like the earth, exhibit great inequalities. Nevertheless, in such a mass as the earth, the mountains subtract less from its spherical figure, than the roughness on the rind of an orange subtracts from its sphericity. For although few mountains on the earth are four miles high, that elevation is but the two-thousandth part of the diameter; and the roughnesses on an orange being taken at the hundredth part of an inch, and the orange at three inches, those roughnesses are the three-hundredth part of the diameter, and, in proportion, six times greater with reference to the whole orange than the highest ridge of mountains is with reference to the earth. Such being the case, in regard to the ridges of the Himalayas in Thibet, and the Andes in South America—the Alps, the Pyrenees, and the mountains of Scotland and Wales, sink into comparative insignificance.

The formation of mountains is a subject of difficulty. If the sea now flowed over the countries in which they are situated, they would constitute chains of islands in those seas; and from what we know of the depth of soundings round St Helena, and other islands, we may consider them as mountains rising from the bed of the present ocean. The circumstance, that marine remains are found at great

elevations in mountains, demonstrates, beyond the possibility of doubt, that the sea must, for many ages, have flowed at those elevations. But the apexes seem by their structure to have constituted parts of the original crust of the earth; unless indeed we are to suppose, that, in all instances, they are volcanic, and have been raised to their present heights by discharges of lava, and the scoriæ of internal local fires. This last seems to be a probable supposition, and, in that case, mountains must be regarded as the work of time. When raised, the returning action of the sea at their base may have undermined them, and we may probably ascribe to their overthrow, many surprising irregularities which appear on the surface of the earth.

With regard to the formation of minor hills and valleys, there seems no difficulty in ascribing them to the action of water. For it is a well known fact, that successive tides acting on the loose shingle, and sand on the shores, press the base of any elevation, in such a manner, as constantly to raise it higher and higher above the water; insomuch that the sea thus forms its own banks and boundaries. Almost every coast presents instances of these formations, but they are particularly conspicuous in the sand-hills on the coast of Flanders, where a line of sand-hills has palpably been forced up, and gradually accumulated by the sea, to the height of one, or two hundred feet above its level. Hence, it is not even necessary, that recurring tides should actually overflow a country to form its hills and inequalities.

The most striking circumstance in the structure of rocks, is their disposition into strata, or layers, placed one above the other, sometimes thick, but

sometimes so thin as to present the appearance of what we call *slate.* This stratified structure deserves notice, not only in itself, but as affording an index to the early formation of the globe, since it can only be accounted for by the supposition of these rocks having been deposited from water. A great proportion of rocks, however, are unstratified, and their points are arranged sometimes in globular or columnar masses, but more frequently with perpendicular and cross rents, giving to the face of such rocks the appearance of stairs, whence mineralogists have applied to them the appellation of *trap.* These original formations are variously traversed by foreign substances, in the form of *veins,* which exhibit many curious phenomena, and in which the more valuable metallic and mineral substances are usually found incorporated.

Mr Jameson observes, that the form of every mountain depends upon the species of rock of which it is composed, and is not affected by any other circumstance. Granite, when exposed, exhibits high and steep cliffs, sometimes vast mural precipices, and often shoots up into those lofty and precipitous summits which are denominated *peaks.* This steep and rugged character is less conspicuous in *gneiss,* and still less in *mica slate,* while in clay slate there appear only smooth and round-backed mountains, without cliffs or precipices. The earlier limestone presents rough cliffs, immense mural precipices, narrow and deep valleys. The later or floetz limestone, forms extensive tracts of flat country, intersected by narrow and deep valleys, sometimes by rocky cliffs and tremendous rents. Fragments of rock falling into these valleys, and being cemented by calc fintex, form

large caves, which accompany this limestone in every part of the globe. These caves abound in the mountains of Germany, particularly in the Julian Alps.—*Shaw's Nature Displayed.*

MOUNT ARARAT.

After we had writ our Journal fair, we three at table held a council, to consider what route to take the next day. We ran no hazard of being understood, because we talked French; and who is there upon Mount Ararat who can boast he understands French? Not even Noah himself, if he was to come thither again with his ark. We considered what the shepherds had said, which we looked upon as very material, especially that insuperable difficulty of the want of drink; for we reckoned it nothing to scale a mountain they represented so frightful. How vexatious is it, said we, to have come so far, to have gone up one quarter part of the mountain, to have found but three or four rare plants, and turn back again without going any farther! We advised with our guides: they, good men, unwilling to expose themselves to the danger of dying for thirst, and having no curiosity, at the expense of their legs, to measure the height of the mountain, were at first of the same sentiments with the shepherds, but afterwards concluded we might go to certain rocks, which stood out farther than the rest, and so return to rest at night in the same place we were now in. This expedient seemed very reasonable, and with this resolution we went to bed; but who

could sleep under the inquietude in which we were? In the night, the love of plants overcame all other difficulties; and we three, by ourselves, concluded it was for our honour to ascend the mountain up to the snow, and venture being devoured by tigers. As soon as it was day, for fear we should die of thirst in our journey, we began to drink plentifully, and put ourselves to a sort of voluntary torture. The shepherds, who were become a little sociable, laughed heartily, and took us for persons who were endeavouring to destroy ourselves. After this precaution it was necessary to dine, and it was no less punishment to eat without being hungry than it was to drink without thirst; but it was absolutely necessary, for there was no conveniency upon the way; and we were so far from being able to carry provisions with us, that it was with difficulty we could carry even our clothes through such bad ways. We ordered two of our guides to go with our horses, and wait for us at the abandoned Convent at the bottom of the abyss. We are forced to describe it thus, to distinguish it from that other abandoned Convent at Acourlou, which serves only for a retreat for passengers.

After this, we began to travel towards the first range of rocks, with one bottle of water, which, to ease ourselves, we carried by turns; but notwithstanding we had made pitchers of our bellies, in two hours time they were quite dried up; and water shook in a bottle is a very disagreeble sort of drink. Our only hope, therefore, was to come at the snow, and eat some of it to quench our thirst. The pleasure of simpling is, that one may,

under pretext of seeking plants, ramble as much as one pleases out of the direct road, and so tire ourselves less than if we were forced to ascend right up; moreover, it is a very agreeable amusement, especially when we discover any new plants. However, though we did not meet with many novelties, yet the hope of a good harvest made us advance briskly. It must be acknowledged, that the sight is very much deceived, when we stand at the bottom, and guess at the height of a mountain, and especially when it must be ascended through sand as troublesome as the Syrtes of Africa. It is impossible to take one firm step upon the sand of Mount Ararat, and in good philosophy one loses a great deal more motion than when one walks on firm ground. What a feast was it for those who had no water but what was in their bellies, to sink every step up to the ancle in sand! In many places, instead of ascending, we were obliged to go back again down to the middle of the mountain, and, in order to continue our course, to wind sometimes to the right, and sometimes to the left. When we met with any mouse-ear, it made our boots as smooth as glass, and so slippery, that we were forced to stand still. In truth, we were two or three times about to have given up our design. And it had been better we had, than in vain to strive against such a horrible sand, and a mouse-ear so short, that the most hungry sheep could not brouze on it. However, the reflection that we had not seen all, would have given us uneasiness afterwards, and we should have been apt to fancy we had neglected the best places. It is natural to flatter ourselves in these sorts of inquiries, and to believe that we only want a lucky minute to find

something extraordinary, which would make amends for all our pains. Besides, the snow which was always in our view, and which seemed to draw nearer to us, though, indeed, it was a great way off, attracted us very powerfully, and bewitched our eyes continually; and yet the nearer we approached it, the fewer plants we found.

To avoid the sand, which fatigued us intolerably, we took our way to the great rocks heaped on one another, like Ossa upon Pelion, to speak in the language of Ovid. We pass under them as through caverns, wherein we are sheltered from all the injuries of the weather, except the cold, which we felt there very sensibly, and served a little to allay our thirst. We were obliged to leave this place quickly, lest we should get a pleurisy; and came into a very troublesome way, full of stones, much like the stones used at Paris by the masons; and we were forced to leap from one stone to another. This exercise we found very tiresome, and we could not but laugh to see ourselves forced to take such methods, though in truth it was but from the teeth outwards. For my part, being quite tired out, and not being able to go any farther, I first began to repose myself, which was an excuse for the rest of the company to do the like.

As the conversation is commonly renewed when we are sat down, one talked of the tigers which walked about very quietly, or played at a good reasonable distance from us. Another complained that he could not breathe; and for my own part, I never was more afraid that some lymphatic vessel was broken in my body. In fine, amidst all these little passages with which we endeavoured to amuse ourselves, and which seemed to give us

new strength, we came about noon to a place more pleasing, for it seemed as if we were ready to take hold of the snow with our teeth. But our joy lasted not long; for what we had taken for snow was only a chalk rock, which hid from our sight a tract of land above two hours' journey distant from the snow, and which seemed to us to have a new kind of pavement, not of little flints, but small pieces of stone, broken off by the frost, and whose edges cut like flints. Our guides told us their feet were quite bare, and that ours would quickly be so too that it grew late, and we should certainly lose ourselves in the night, or break our necks in the dark, unless we chose to sit ourselves down to become a prey to the tigers, who ordinarly make their chief attempts in the night; all which seemed very probable. However, our boots were not bad yet. After having looked on our watches, which we kept in very good order, we assured our guides that we would go no farther than a heap of snow which we showed them, and which did appear to be hardly bigger than a cake. But when we came to it, we found more than we had need of; for the heap was above thirty paces in diameter. We every one eat more or less, as we had a mind; and by agreement resolved to advance no further. This snow was above four feet thick; and being frozen hard, we took a great piece to fill our bottle. It cannot be imagined how much the eating of snow revives and fortifies. Sometime after we felt a glowing heat in our stomachs, like that in the hands, after having held snow in them half a quarter of an hour; and far from causing griping pains, as most imagine it must, it was very comfortable to our inward parts. We descended, there-

fore from the snow with a wonderful vigour, much pleased that we accomplished our desire, and that we had now nothing farther to do but to retire to the monastery.

As one good fortune is generally followed by another, by chance I perceived a small green plat, which glittered among the ruinous fragments of stone. We ran thither as to a treasure, and were highly pleased with the discovery. It was an admirable species of veronica telephii folio: But we did not stay there long, our thoughts being now much taken up with our return; and our pretended vigour was not of long duration; for we came to sands which lay behind the abyss, and were full as troublesome as the former. When we endeavoured to slide along, half our bodies were buried; besides, we could not keep the direct way, but were obliged to go to the left to come to the edge of the abyss, of which we had a mind to take a nearer view. And, indeed, it is a most frightful sight. David might well say, such sort of places show the grandeur of the Lord. One cannot but tremble to behold it; and to look on the horrible precipices, ever so little, will make the head turn round. The noise made by a vast number of crows, who are continually flying from one side to the other, has something in it very frightful. To form any idea of this place, you must imagine one of the highest mountains in the world opening its bosom, only to show the most horrible spectacle that can be thought of. All the precipices are perpendicular, and the extremities are rough and blackish, as if a smoke came out of the sides, and smutted them. About six o'clock afternoon, we found ourselves quite tired out and spent; and

were not able to put one foot before another, but were forced to make a virtue of necessity, and merit the name of martyrs to botany.

We at length observed a place covered with mouse-ear, whose declivity seemed to favour our descent, that is to say, the way Noah took to the bottom of the mountain. We ran thither in haste, and then sat down to rest ourselves; and found there more plants than we had all the journey beside. And what pleased us mighty well, was, that our guides showed us from thence, but at a great distance from us, the monastery whether we were to go to quench our thirst. I leave it to be guessed what method Noah made use of to descend from this place, who might have rid upon so many sorts of animals which were all at his command. We laid ourselves on our backs, and slid down for an hour together upon this green plat, and so passed on very agreeably, and much faster than we could have gone on our legs. The night and our thirst were a kind of spurs to us, and caused us to make the greater speed. We continued, therefore, to slide in this manner, as long as the way would suffer us; and when we met with small flints which hurt our shoulders, we turned, and slid on our bellies, or went backwards on all four. Thus, by degrees, we gained the monastery; but so disordered and fatigued by our manner of travelling, that we were not able to move hand or foot. We found some good company in the Monastery, the gates of which are open to every body for want of fastenings. The people of the town had taken a walk thither, and were just going away as we came; but to our great misfortune had neither wine nor water. We were,

therefore, forced to send to the river; but had no vessel beside our leathern bottle, which held not above a quart. And what a punishment was it for the guide on whom the lot fell, to go to the river, and fill it? He had the happiness, indeed, to be the first who drank; but nobody envied him. For he paid dear enough for it; the descent from the monastery to the river was near a quarter of a league down-right, and the way very rugged. One may guess how pleasant his journey was back again. It took up half an hour to go and come; and the first bottle was almost drank out at one draught. The water seemed like nectar; but we were forced to wait another half-hour for a second bottle, which was misery enough. We took horse that night for the town, to get some bread and wine; for, after all the pains we had taken, we found our bellies very empty. We did not reach the town till about midnight; and he that kept the key of the church in which we were to lodge, was sleeping at his ease at the other end of the town. We were very happy now in having found some bread and wine. After this light supper, we got into a good sound sleep, without being disturbed by dreams, any uneasiness, or indigestion, or so much as in the least feeling the sting of the gnats.—*M. Tournefort's Travels.*

VOLCANOES.

The most remarkable changes which have taken place in the form and constitution of the earth since the deluge, have probably been produced by sub-

terraneous fires; for it is to their agency that philosophers ascribe volcanoes and earthquakes—those tremendous instruments of nature, by which she converts plains into mountains, the ocean into islands, and dry land into stagnant pools. When these fires were first kindled—by what sort of fuel they are still maintained—at what depths below the surface of the earth they are placed—whether they have a mutual communication—of what dimensions they consist—and how long they may continue:—are questions which do not admit an easy decision.

Volcanoes generally exist in the vicinity of the sea, or large lakes, and also break out from unfathomable depths below the sea, and form new islands with the melted lava and stones which they eject. When a volcano breaks out in a new situation, it forms a vast rent or fissure, through which lava and stones are thrown out, that soon choke up the passage, and confine the eruption to one or more openings, round which a conical mountain is formed, the open part of which is called the Crater.

The indications of an approaching eruption are, an increase of smoke from the summit, which sometimes rises to a vast height, branching in the form of a pine-tree. Tremendous explosions, like the firing of artillery, commence after the increase of smoke, and are succeeded by red-coloured flames and showers of stones. At length the lava flows out from the top of the crater, or breaks through the sides of the mountain, and covers the neighbouring plains with melted matter, which becoming consolidated, forms a stony mass often not less than some hundred square miles in extent,

and several yards in thickness. The eruption has been known to continue several months. The quantity of volcanic powder, called ashes, thrown out, is inconceivably great. During one eruption of Etna, a space of 150 miles in circuit was covered with a stratum of sand twelve feet thick. When the lava flows freely, the earthquakes and explosions become less violent, which proves that they were occasioned by the confinement of the erupted matter, both gaseous and solid. The smoke and vapour of volcanoes are highly electrical. The long period of repose which sometimes takes place between two eruptions of the same volcano, is particularly remarkable.

In the volcanic land, series of points may be traced, seemingly connected. The whole granitic chain which borders the Pacific is crowned by volcanoes, beginning at the Straits of Magellan, with the Andes, which, in Chili, has fourteen burning craters. Those of Peru are most numerous and terrible, as are those of the isthmus of Mexico and California. The littoral chain to Alashka offers several volcanoes, some in activity. Others are found in that semicircular chain of islands between the continents, terminating near Kamschatka, in which peninsula are five active volcanoes, besides many extinct craters, which reach to Daouria.

South of Kamschatka, the ignivomous chain traces the Kourvilla Isles, Jesso, and Japan. A series of volcanic islets joins on to the Marianne Isles, which have nine active volcanoes, and thence through Polynesia. Another branch runs south, by Lieou, Kiou, Formosa, Philippines, Indian Archipelago, and Australasia, to New Zealand,

where remain unequivocal signs of subterranean fires.

Several ramifications go off to the Indian sea. In the Mauritius is an active volcano; the Isles of France and Madagascar, St Paul and Amsterdam, are covered with leaves, ashes, and scoriæ; the mineral waters and confused mountains of the Cape of Good Hope indicate subterraneous fires. The Gebel Tar is an extinct crater, at the entrance of the Red Sea, between the ancient volcanoes of Upper Egypt and Syria, which join those of America and Caucasus, and the isles of the Archipelago, whose fires burst forth occasionally in the caverns of Lemnos, Milo, and Santorin.

The Ionian Isles, in the Adriatic, are volcanic, and ignivomous mountains, are on the coast. Sicily has its Etna, Naples its Vesuvius, and Strombolo in the islands of Lipari. All Italy offers vestiges of ancient volcanoes, by the Apennines; the coasts of Provence, where are the extinct craters of Olioules and Evenos; another on the Alps of Dauphiny; and in Spain are the solfataras, leaves, and puzzolanas in the environs of Burgos. All Upper Germany, between the Alps and Krapacks, indicates ancient volcanoes, especially in Bohemia, Hesse, Lusatia, Hungary, Silesia, &c. Mount Atlas rests on volcanic ground, and also the islands of St Helena and Assumption, composed of leaves and ashes; the Cape Verd Islands, of which Fuego always throws out flames; the Canaries, whose Peak of Teneriffe is a higher volcano than Etna; the Azores, incessantly disordered by submarine fires; the British Isles, with Ireland, famed for its Giants' Causeway; the Hebrides, the Feroe islands; and, finally, Iceland, which terminates this long

chain by Mount Heckla, a focus more active than Vesuvius. On the coast of America, Guadaloupe, Dominica, Trinidad, &c. have active craters.

In this great number of volcanoes, only those are igniyomous situated near the sea; the others were so when the ocean was not yet fixed in its actual basin. These ancient volcanoes, are not in a greater quantity on acconnt of the unequal periods of their existence. Their fires ceased, as the ocean no longer bathed the sides of the craters, and others were formed, which disappeared from the same causes. Thus the extinct volcanoes indicate the successive retreat of the waters, and of the limits of their basin. But such observations are very incomplete; and even in the centre of Europe, doubts remain on the volcanic nature of some lands. The absence of volcanoes in the north, is consequent on these countries being the last abandoned by the sea, and too low for a focus to subterraneous fires. By comparing localities, the neighbourhood of the sea, and the elevation of the land, are necessary circumstances for this phenomenon. Hence, volcanoes are so terrible in the chain of the Cordilleras, so frequent in high islands, and so rare, or rather unknown, on low coasts.—*Shaw's Nature Displayed.*

ERUPTION OF VESUVIUS IN 1767.

VESUVIUS was quiet until March 1767, when it began to throw up stones from time to time. In April the throes were more frequent, and at night

fire was visible on the top of the mountain; or, more properly speaking, the smoke which hung over the crater was tinged by the reflection of the fire within the volcano. These repeated throes increased the little mountain (which had previously been observed within, but not so high as the rim of the ancient crater) so much, that in May its top became visible above it. The 7th of August there issued a small stream of lava from a breach in the side of this little mountain, which gradually filled the valley between it and the ancient crater; so that on the 12th of September the lava overflowed the ancient crater, and took its course down the sides of the great mountain; by this time the throes were much more frequent, and the red hot stones went so high, as to take up ten seconds in their fall. Padre Torre, a great observer of Mount Vesuvius, says they went up above a thousand feet.

The 15th of October, the height of this little mountain, formed in about eight months, was measured by Don Andrea Pigonati, a very ingenious young man, in his Sicilian Majesty's service, who assured me that its height was 185 French feet. From my villa, situated between Herculaneum and Pompeii, near the Convent of Calmaldolese, I had watched the growing of this little mountain, and by taking drawings of it from time to time, could perceive it increase minutely. I make no doubt the whole of Vesuvius has been thrown up in a similar manner. The lava continued to run over the ancient crater in small streams, sometimes on one side and sometimes on the other, until the 18th, when I took particular notice that there was not the least lava to be seen, owing, I imagine, to its being employed in forcing its way towards the place where

it burst out the following day. As I had, contrary to the opinion of most people here, foretold the approaching eruption, and had observed a great fermentation in the mountain, after the heavy rains which fell the 13th and 14th of October, I was not surprised on the 19th following, at seven in the morning, to perceive from my villa, every symptom of the eruption being just at hand. From the top of the little mountain, issued a thick black smoke, so thick, that it seemed to have difficulty in forcing its way out; cloud after cloud mounted with a hasty spiral motion, and every minute a volley of great stones was shot up to an immense height, in the midst of these clouds. By degrees, the smoke took the exact shape of a huge pine tree, exactly such as Pliny described in his letter to Tacitus. This column of black smoke, after having mounted an extraordinary height, bent with the wind towards Caprea, and actually reached over that island, which is not less than twenty-eight miles from Vesuvius. I warned my family not to be alarmed, as I expected there would be an earthquake the moment of the lava breaking out; but before eight in the morning, I perceived the mountain had opened a mouth without noise, about one hundred yards lower than the great crater, on the side towards the *Monte di Somma;* and I plainly perceived, by a white smoke which always accompanies the lava, that it had forced its way out. As soon as it had vent, the smoke no longer came out with so much violence from the top. As I imagined there would be no danger in approaching the mountain, as soon as the lava had found vent, I went up immediately, accompanied

by one peasant only. Having passed the hermitage, and arrived at a place called *Atrio di Cavallo*, between the mountain of Somma and that of Vesuvius, I was making my observations on the lava, which had already reached the valley, when, on a sudden, I heard a violent noise within the mountain, and, about a quarter of a mile from the place where I stood, the mountain split. From this new mountain, a fountain of liquid fire shot up several feet high, and then, like a torrent, rolled on directly towards us. The earth shook, and at the same time a volley of pumice stones fell thick upon us. In an instant, clouds of black smoke and ashes caused almost a total darkness. The explosions from the top of the mountain were much louder than any thunder I ever heard, and the smell of sulphur was very offensive. My guide alarmed, took to his heels, and I must confess, I did not feel at all at my ease. I followed him close, and we ran nearly three miles without stopping, while the earth continued to shake under our feet. I was apprehensive of the opening of a fresh mouth, which might have cut off our retreat. I also feared that the violent explosions would detach some of the rocks off the mountain of Somma, under which we were obliged to pass; besides, the pumice stones, falling on us like hail, were of such size as at times to annoy us exceedingly. After having taken breath, as the earth still trembled greatly, I thought it most prudent to leave the mountain and return to my villa, where I found my family in great alarm, at the continual and violent explosions of the volcano, which shook our house to its foundation, the doors and windows swinging on their hinges. About two in the af-

ternoon, another stream of lava forced its way from the same place that it had proceeded last year, so that now the conflagration was as great on this side of the mountain as on the other. The noise and smell increasing, we removed from our villa to Naples, and I thought proper, as I passed by Portici, to inform the court of what I had seen, and humbly offered it as my opinion, that his Sicilian majesty should leave the neighbourhood of the threatening mountain. The court, however, did not leave Portici until about twelve o'clock, when the lava had extended considerably. I observed in my way to Naples, which was less than two hours after I had left the mountain, that the lava had actually covered three miles of the very road through which we had retreated. It is astonishing it should have run so fast, as I have since seen that the river of lava in the Atrio di Cavallo was 60 and 70 feet deep, and in some places nearly two miles broad. When his Sicilian majesty quitted Portici, the noise was greatly increased; and the confusion of the air, from the explosions, was so violent, that in the king's palace, doors and windows were forced open, and even one door there, which was locked, was nevertheless burst open. At Naples, the same night, many windows and doors flew open. In my house, which is not on the side of the town next Vesuvius, I tried the experiment of unbolting my windows, when they flew wide open upon every explosion of the mountain. Besides these explosions, which were very frequent, there was a continued, violent, and subterraneous rumbling noise, which lasted this night about five hours. I have imagined that this extraordinary noise might be owing to the lava in

the bowels of the mountain having met with a deposition of rain water, and that the conflict between the fire and the water may in some measure account for so extraordinary a crackling and hissing noise. Padre Torre is also of my opinion; and indeed it is natural to imagine, that there may be rain water lodged in many of the caverns of the mountain, as in the great eruption of Vesuvius in 1663, it is well attested, that several towns, among which were Portici and Torre del Greco, were destroyed by a torrent of boiling water having burst out of the mountain with the lava, by which many thousand lives were lost. In Sicily, about four years ago, Mount Etna threw up hot water also during an eruption.

The confusion at Naples throughout the night cannot be described; his Sicilian majesty's hasty retreat from Portici added to the alarm. All the churches were opened and filled, and the streets thronged with processions of Saints. I shall avoid, in this place, entering into a description of the various ceremonies which were had recourse to, in order to quell the fury of the turbulent mountain.

Next morning, it was impossible to judge of Vesuvius, from the smoke and ashes which covered it entirely, and extended over Naples, where the sun appeared as if shining through a thick London fog, or a smoked glass. Small ashes fell all day at Naples. The lavas on both sides the mountain ran violently; but there was little or no noise until about nine o'clock at night, when the same rumbling began again, accompanied with explosions, and lasted about four hours. It seemed as if the mountain would split into pieces, and, indeed, another very considerable opening near its

summit was made. The confusion in the city continued great throughout the night. The prisoners in the public gaol attempted to escape, but were prevented by the troops. The mob also set fire to the Cardinal-Archbishop's gate, because he refused to bring out the relics of Saint Januarius.

Next day was more quiet than the preceding, though the lavas burnt briskly. Portici was once in some danger, had not the lava taken a different course, when only a mile and a half distant from it. Towards night, the lava streams abated.

The following morning, about ten o'clock, the same thundering noise again commenced, and even with more violence than on any of the preceding days. The oldest men declared they had never heard the like; and we were every moment fearfully expecting some dire calamity. The ashes,—or rather small cinders,—showered down so fast, that the people in the streets were obliged to use umbrellas, or flap their hats, to prevent the ashes injuring their eyes. The tops of the houses and the balconies were covered above an inch thick with cinders. Ships at sea, twenty leagues from Naples, were also covered with them, to the astonishment of the sailors. In the midst of these horrors, the mob grew impatient and tumultuous, and at length obliged the Cardinal to bring out the head of St Januarius, and go with it in procession to the Ponte Maddalena, at the extremity of Naples, towards Vesuvius; and here, therefore, it is well attested, that the eruption ceased the moment the head of the saint came within sight of the mountain. It is true, the noise ceased about that time, having lasted about five hours, as it had done the preceding days.

The next day the lavas still ran; but the following it ceased. The three succeeding days, the mountain continued emitting stones and ashes. At one time the latter formed a vast column, as black as the mountain itself, and its shadow was reflected along the surface of the sea. Continual flashes of forked and zig-zag lightning shot from it, while its thunder was heard in the neighbourhood of the mountain. After this the smoke continued less thick, and finally disappeared. No signs of any further eruption then followed.—*Phil. Trans. Vol.* 58, *for the Year* 1768.

MOUNT ETNA.

We set out at three o'clock from Catania, and began our march in frightful roads through rocks of lava, which cover the first part of the route. We continued our journey in a road covered with lava, but bordered with superb Indian fig-trees. After proceeding five or six miles, we past through the village of Gravelina, where I was assailed by nearly the whole population demanding charity. Some miles further we perceived, and afterwards passed through another village called Masca-Luscia. It contains two churches; one of which, nearly destroyed by an earthquake, was never very remarkable, and the other is only rendered so by a steeple fantastically decorated with stones of various colours. We arrived, in fine, at the last village, that of Nicolosi, which appeared poorer than all the rest. This was surely, in former times, the town of Etna where the inhabitants of Catania

took refuge on the arrival of the Greeks. The environs abound in olive trees and vineyards, which produce excellent wine. All this part was covered with ashes by the eruption of Monte Rosso, a secondary volcano, which formed itself at the time of the last eruption. Monte Rosso is one of those mountains by which Etna is surrounded. It appears, when an eruption takes place, the lava, making its way on the flanks of the mountain, pierces the ground in the place which offers the least resistance, and there forms a swelling, which it afterwards consolidates, by flowing from above. In this village we found the guide, or, as he is called, the Pilot of Etna. After some conversation, he engaged to ascend for three piastres, about twelve shillings and sixpence. From thence to the convent where we were to rest our beasts, we had no more than a mile to go, which we performed by coasting along Monte Rosso, whose summit was gilded by the sun, and behind which it had already set when we arrived. This mountain is several miles in circumference. I profited by the last light of the sky, in order to sketch a view of the convent, which, although of the common extent, is nevertheless picturesque. Built against a small hill, long since become cold, and covered with woods, it seems sheltered from the destructive effects of the volcano. From the other side, between superb fir-trees, you perceive the sea, the plains of Catania, and Syracuse. We were four hours in coming from Catania, which is notwithstanding only a distance of twelve miles. I slept here, and we set out at half past nine, by moon-light. We first entered into an immense torrent of lava. The uncertain glimmerings

of the moon gave an extraordinary aspect to the huge masses by which I was surrounded. Soon after, long shadows scattered here and there, and a trembling of the leaves, announced the approach to the forest of oaks, which formerly encircled Etna to the height of several miles, but which an immense torrent of lava had ravaged. We now entered into the most fantastical lavas; they have more of a slope, and the crevices which form these, as soon as they become cold, acquire more extent, and present a more rent appearance. Having arrived near a mass of snow which filled one of the narrow passes of the mountain, a summit that looked black in the sky, made me believe that I was at the end of the journey. An old tower, which I took for the *Torre del Filosofo*, confirmed me in my error. I soon after perceived another summit, covered with a whitish smoke. I asked if it was much higher than the other. My guide affirmed that it was; and he was in the right; for it seemed to me to surpass the first in the whole height of Vesuvius. The road became more united, and the acclivity gentler. We coasted along a torrent of black lava, the more singular, as its elevation was from eight to ten feet, and perpendicular like a wall, which clearly proved to me that this matter, in flowing, is not in perfect fusion, as great part of the substances which it drags along are sufficiently hard to prevent their melting; and that they are, like the basalt, detached from the immense vaults which, during many ages, supported this natural forge. The sky began to adorn itself in the east, and we perceived the house called *les Anglais*. After a light breakfast, I directed my steps towards the place where,

according to custom, the curious go to behold the rising sun.

I now bent my steps towards the last summit, which, covered with a light white smoke, seemed to move away from the impatient traveller. We walked nearly a mile on almost horizontal lava, or, to speak more correctly, on striated scoriæ or dross, which made a crackling noise under our feet, and soon after on a swamp of snow, where we found a large round stone, three feet in diameter, of the species of those called volcanic balls, which the mountain throws up in great eruptions; but it is only a grain of metal in comparison with the volcano which ejected it from its bosom. In fine, we mounted the last cone which supports the crater, the ashes and the stones slipping under our feet. The cold was excessive, but exercise kept us warm. I quitted my cloak, and rolling up some pieces of lava in it, I left it on the mountain. At last we arrived on the borders of the crater; but the wind was so violent that I could scarcely cast a glance over it. I was thrown down; and had it not been for my *Cicerone*, I might have rolled to the foot of the declivity which had given us so much trouble to ascend. Fastened, and lying down at the ridge of the crater, I considered it at my ease, and braved the fury of Æolus and Vulcan.

It is a vast aperture, having four summits of different heights, rather more than a mile in width; and, on account of its inequalities, I should think it about four in circumference. It is divided into two craters by a cone rising from its centre, and which forms a crater itself, the cone of which is not very rapid. The ancient aperture is united to

this cone by a gentle declivity, where has probably been formed, within a recent period, a small crater, a partial volcano, a perfect truncated cone, from whence issues a great quantity of smoke. The general aspect of the crater is much less dreary than that of Vesuvius; the substances surrounding it are not so black, but have rather the colour of potter's earth. I could not make the entire tour of the crater, on account of the violence of the wind, which prevented me also from descending into the interior, which appeared to me less rapid than that of Vesuvius.—*Monsieur Gourbillon's Travels in* 1819.

MOUNT HECLA—ITS ASCENT.

We rose at an early hour on the third of August, with the intention of ascending this mountain, whose fame has spread through every quarter of the globe. At ten o'clock we were ready; and having collected our horses, we mounted them, and began our expedition under circumstances as favourable as we could wish. We rode through sand and lava for about three miles, when the surface became too rugged and steep for horses. Our guide proposed leaving the poor animals standing till we returned; but though they would not have stirred from the spot, we sent them back, not choosing such valuable and steady servants should remain a whole day without food. We now proceeded a considerable way along the edge of a stream of lava, and then crossed it where it was not very broad, and gained the foot of the south

end of the mountain. From this place we saw several mounts and hollows, from which the streams of lava from below appeared to have flowed. While we had to pass over rugged lava, we experienced no great difficulty in advancing; but when we arrived at the steepest part of the mountain, which was covered with loose slags, we sometimes lost at one step, by their yielding, a space that had been gained by several. In some places we saw collections of black sand, which, had there been any wind, might have proved exceedingly troublesome. The ascent now became very steep, but the roughness of the surface greatly assisted us.

Before we had reached the first summit, clouds surrounded us, and prevented our seeing further than a few yards. Placing implicit confidence in our guide, we proceeded; and having attained what we thought was the nearest of the three summits, we sat down to refresh ourselves, when he informed us he had never been higher up the mountain. The clouds occasionally dividing, we saw we had not reached the southern summit. After having passed a number of fissures, by leaping across some, and stepping along masses of slags that lay over others, we at last got to the top of the first peak. The clouds now became so thick, that we began to despair of reaching farther. Indeed it was dangerous even to move; for the peak consists of a very narrow ridge of slags, not more than two feet broad, having a precipice on each side many hundred feet high. One of these precipices forms the side of a vast hollow, which seems to have been one of the craters. At length the sky cleared a little, and enabled us to discover a ridge below, that seemed to connect the

peak we were on with the middle one. We lost no time in availing ourselves of this opportunity; and, by balancing ourselves like rope-dancers, we succeeded in passing along a ridge of slags, so narrow that there was hardly room for our feet. After a short but very steep ascent, we gained the highest point of this celebrated mountain.

We now found that our usual good luck had not forsaken us; for we had scarcely begun to ascend the middle peak, when the sky became clear, and we had a fine and full view of the surrounding country. Towards the north it is low, except where a Jokul here and there towers into the regions of perpetual snow. Several large lakes appeared in different places, and among them the Fiske Vatn was the most conspicuous. In this direction, we saw nearly two-thirds across the island. The Blæfall and the Large Jokuls stretched themselves in distance to a great extent, presenting the appearance of enormous masses of snow heaped up on the plains. The Skaptaa Jokul, whence the great eruption that took place in 1783 broke forth, bounded the view towards the north-east. It is a large, extensive, and lofty mountain, and appeared to be covered with snow to the very base. On the side next to us, though at a distance of about forty miles, we plainly discerned a black conical hill, which very probably may be the crater that was formed during the eruption. The Torfa, Tinfialla, and Eyafialla Jokuls, limit the view of the eastern part of the country. Towards the south, the great plain we had passed through seemed as if stretched under our feet, and was bounded by the sea. The same valley was terminated, towards the west, by a range of curiously

peaked mountains—those in the neighbourhood of Thingualla, and to the north and west of the Geysers.

The middle peak of Hecla forms one side of a hollow, which contains a large mass of snow at the bottom, and is evidently another crater. The whole summit of the mountain is a ridge of slags, and the hollows on each side appear to have been so many different vents, from which the eruptions have from time to time issued. We saw no indication that lava had flowed from the upper part of the mountain; but our examination, from the frequent recurrence of fog, was unavoidably confined.

After we had satisfied ourselves with viewing the surrounding country, we began to collect specimens of the slags, and perceived some of them to be warm. On removing some from the surface, we found those below were too hot to be handled; and on placing a thermometer amongst them, it rose to 144°. The vapour of water ascended from several parts of the peak. It had been remarked to us by many of the inhabitants, that there was less snow on Heckla at this time than had been observed for many years. We supposed, therefore, that the heat now noticed might be the recommencement of activity in the volcano, rather than the remaining effects of the last eruption, which took place in the year 1766. Letters from Iceland, dated on the 24th of October, mention that, on the morning of that day, a shock of an earthquake was felt. This, however, does not always indicate an approaching eruption.

The crater, of which the highest peak forms a part, does not much exceed a hundred feet in depth. The bottom is filled by a large mass of snow, in which various caverns had been formed by its partial melting. In these the snow had become solid and transparent, reflecting a blueish tinge; and their whole appearance was extremely beautiful, reminding us of the description of magic palaces in Eastern tales.

At the foot of the mountain, at nine o'clock, the thermometer stood at 59°; at eleven it was 55°; and at four, on the top, at 39°. Our descent was greatly retarded by thick fog, and we found it much more hazardous than the ascent. We missed our way, and were under the necessity of crossing the lava we had passed on our way up, at a place where it had spread to a much greater breadth, and, from the rapidity of the slope along which it had flowed, had become frightfully rugged.—*Sir G. Mackenzie's Travels in Iceland.*

SULPHUR MOUNTAINS.

THE 25th was a delightful day, and having taken an early breakfast of biscuit, cheese, and milk, we set out towards the Sulphur Mountain, which is about three miles distant from Krisuvik. At the foot of the mountain was a small bank composed chiefly of white clay, and some sulphur, from all parts of which steam issued. Ascending it, we got upon a ridge immediately above a deep hollow, from which a profusion of vapour arose, and heard a confused noise of boiling and splashing, join-

ed to the roaring of steam escaping from narrow crevices in the rock. This hollow, together with the whole side of the mountain opposite, as far up as we could see, was covered with sulphur and clay, chiefly of a white or yellowish colour. Walking over this soft and steaming surface we found to be very hazardous; and I was frequently very uneasy when the vapour concealed my friends from me. The day, however, being dry and warm, the surface was not so slippery as to occasion much risk of our falling. The chance of the crust of sulphur breaking, or the clay sinking with us, was great, and we were several times in danger of being much scalded. Mr Bright ran at one time a great hazard, and suffered considerable pain, from accidentally plunging one of his legs into the hot clay. From whatever spot the sulphur is removed, steam instantly escapes; and in many places the sulphur was so hot, that we could scarcely handle it. From the smell, I perceived that the steam was mixed with a small quantity of sulphuretted hydrogen gas. When the thermometer was sunk within the clay, it rose generally to within a few degrees of the boiling point. By stepping cautiously, and avoiding every little hole from which steam issued, we soon discovered how far we might venture. Our good fortune, however, ought not to tempt any person to examine this wonderful place without being provided with two boards, with which any one may cross every part of the banks in perfect safety. At the bottom of this hollow we found a caldron of boiling mud, about fifteen feet in diameter, similar to that on the top of the mountain which we had seen the evening before; but this boiled with much more vehemence. We went within

a few yards of it, the wind happening to be remarkably favourable for viewing every part of this singular scene. The mud was in constant agitation, and often thrown up to the height of six or eight feet. Near this spot was an irregular space filled with water, boiling briskly. At the foot of the hill, in a hollow formed by a bank of clay and sulphur, steam rushed with great force and noise from among the loose fragments of rock. Further up the mountain we met with a spring of cold water, a circumstance little expected in a place like this. Ascending still higher, we came to a ridge composed entirely of sulphur and clay, joining two summits of the mountain. Here we found a much greater quantity of sulphur than on any other part of the surface we had gone over. It formed a smooth crust from a quarter of an inch to several inches in thickness. The crust was beautifully crystallized. Immediately beneath it we found a quantity of loose granular sulphur, which appeared to be collecting and crystallizing, as it was sublimed along with the steam. Sometimes we met with clay of different colours, white, red and blue, under the crust; but we could not examine this place to any depth, as the moment the crust was removed steam came forth, and proved extremely annoying. We found several pieces of wood, which were probably the remains of planks that had been formerly used in collecting the sulphur, small crystals of which partially covered them. There appears to be a constant sublimation of this substance, and were artificial chambers constructed for the reception and condensation of the vapours, much of it might probably be collected. As it is, there is a large quantity on the surface, and by

searching, there is little doubt that great stores may be found. The inconvenience proceeding from the steam issuing on every side, and from the heat, is certainly considerable; but by proper precautions, neither would be felt so much as to render the collection of the sulphur a matter of any great difficulty. The chief obstacle to working these mines is, their distance from a port whence the produce could be shipped. But there are so many horses in the country, whose original price is trifling, and whose maintenance during summer costs nothing, that the conveyance of sulphur to Reikiavik presents no difficulties which might not probably be surmounted. Below the ridge, on the farther side this great bed of sulphur, we saw a great deal of vapour escaping with much noise. We crossed to the side of the mountain opposite, and found the surface sufficiently firm to admit of walking cautiously upon it. We had now to walk towards the principal spring, as it is called. This was a task of much apparent danger, as the side of the mountain, for the extent of about half a mile, is covered with loose clay, into which our feet sunk at every step. In many places there was a thin crust, below which the clay was wet, and extremely hot. Good fortune attended us, and we reached, without any serious inconvenience, the object we had in view. A dense column of steam, mixed with a little water, was forcing its way impetuously through a crevice in the rock, at the head of a narrow valley or break in the mountain. The violence with which it rushes out is so great, that the noises thus occasioned may often be heard at the distance of several miles; and during the night, while lying in our tent at Krisuvik, we more

than once listened to them with mingled awe and astonishment. Behind the column of vapour was a dark-coloured rock, which gave it its full effect. It is quite beyond my power to offer such a description of this extraordinary place, as to convey adequate ideas of its wonders or its terrors. The sensations of a person, even of firm nerves, standing on a support which feebly sustains him, over an abyss where literally fire and brimstone are in dreadful and incessant action—having before his eyes tremendous proofs of what is going on beneath him—enveloped in thick vapours, his ears stunned with thundering noises :—these can hardly be expressed in words, and can only be well conceived by those who have experienced them.—*Sir G. Mackenzie's Travels in Iceland.*

HOT-SPOUTING SPRINGS IN ICELAND.

AMONG all the curiosities in Iceland, that nature presents to the eyes of an attentive spectator, to raise his admiration, nothing can be compared to the hot-spouting water-springs with which this country abounds. The hot springs at Aix-la-Chapelle, Carlsbad, Bath, and Switzerland, and several others found in Italy, are considered as very remarkable ; but to my knowledge, except in the last mentioned country, the water no where becomes so hot as to boil ; nor is it any where known to be thrown so high as at the hot-spouting water-springs in Iceland. All those water-works that have been contrived with so much art, and at so enormous an expense, cannot by any means be

compared with these. Those at Herrenhausen throw up a single column of water, of half a quarter of a yard in circumference, to the height of about 70 feet; those on the Winterkasten, at Cassel, throw it up, but in a much thinner column, 130 feet; and that at St Cloud, which is thought the greatest amongst all the French water-works, casts up a thin column 80 feet into the air; whilst some springs in Iceland spout columns of water of several feet in thickness, to the height of many fathoms; and many affirm, of several hundred feet.

But, without relying upon what has been said by others of these wonderful phenomena of nature, I think myself happy to have contemplated with my own eyes the most remarkable of these springs, which has enabled me to give you an accurate account of it. I only beg leave to say something of them in general, before I treat of that I particularly saw.

These springs are of unequal degrees of heat. From some the water flows gently as from other springs, and it is then called *laug*, a bath; from others, it spouts boiling water with a great noise, and is then called *hver* or *kittel* (kettle). Though the degree of heat is unequal, yet I do not remember ever to have observed it under 188 of Fahrenheit's thermometer. At Laugarnas we found it at 188, 191, 193. At Geyser, Reykum, and Laugarvatu 212; and in the last place, in the ground, at a little hot current of water, 213 degrees.

The water in some places tastes of sulphur, and in others not; but when drank, as soon as it is cold, tastes like common boiled water. The inhabitants use some *hvers* at particular times for dye-

ing; and were they to adopt proper regulations, it might be still of more use. Victuals may also be boiled in it, by putting it into a covered pot, and boiling it till a certain quantity is evaporated. Milk, held over this water when boiling, becomes sweet, owing, most probably, to its excessive heat, as the same effect is produced by boiling it a long time over the fire. They have begun to make salt, by boiling sea-water over it, which, when it is refined is very fine and good. The cows that drink of it yield a great quantity of good milk. Eggert Olafsen informs us, that the water does not become troubled when an alkali is thrown into it, nor does it change colour from syrup of violets. I do not know what degree of credit ought to be given to Horrebow, who asserts, that if you fill a bottle at one of the spouting-springs, the water contained in the bottle will boil over two or three times, during the time the spring throws it forth, and if corked too soon the bottle will burst.

Though it cannot be denied that these springs have some communication with the Icelandic volcanoes, yet they are seldom found very near them, but are dispersed throughout the whole country. For this reason hot springs are found not only among the mountains, but also on the top of the ice mountains; as on Torfa Jokul, where a great number of hot springs are to be met with; and among them two large *hvers* that throw up the boiling water to a great height. There are even in the sea hot spouting-springs, that can only be approached at low water; as at Reykafiord in Isa-fiord, where four springs may be observed in the water by the ascending steam, and one *hver* on the surface of the water.

Among the hot springs in Iceland, several of which bear the name of *geyser*, there are none that can be compared with that I am going to describe, though the best description will fall very short of it. It is about two days journey from Heckla, not far from Skallholt, near a farm called Hankadal. Here a poet would have an opportunity of painting a picture of whatever nature has of beautiful and terrible united, by delineating one of its most uncommon phenomena; it would be a subject worthy the pen of a Thomson, to transport the reader by poetical imagery, to the spot that is here presented to the eye. Figure to yourself a large field, where you see on one side, at a great distance, high mountains covered with ice, whose summits are generally wrapt in clouds, so that their sharp unequal points become invisible. This loss, however, is compensated by a certain wind, that causes the clouds to sink, and cover the mountains itself, when its summit appears as it were to rest upon the clouds. On the other side, Heckla is seen, with its three points covered with ice, rising above the clouds, and, with the smoke that ascends from it, forming other clouds at some distance from the real ones; and on the other side is a ridge of high rocks, at the foot whereof boiling water from time to time gushes forth; and further on, a marsh extends of about half a mile in circumference, where are forty or fifty boiling springs, from which a vapour ascends to a prodigious height.

In the midst of these is the greatest spring *geyser*, that deserves a more exact and particular account. In travelling to the place, about a quarter

of a mile from the *hver*, from where the ridge of rocks near it still divided us, we heard a loud roaring noise, like the rushing of a torrent, precipitating itself from stupendous rocks. We asked our guide what it meant, he answered, it was *geyser* roaring; and we soon saw with our eyes what before appeared almost incredible. The depth of the opening or pipe from which the water gushes, cannot well be determined; for sometimes the water sunk down several fathoms, and some seconds passed before a stone that was thrown into the aperture reached the surface of the water. The opening itself was perfectly round, and 19 feet in diameter; it ended above in a bason that was 59 feet in diameter; both the pipe and the bason were covered with a rough stalactitic dust that had been formed by the force of the water. The uttermost border of the bason is nine feet, and an inch higher than the pipe itself.

The water here spouted several times a day, but always by starts, and after certain intervals. The people, who lived in the neighbourhood, told us, that they rose more high in cold and bad weather, than at other times; and Eggert Olafsen and several others affirm, that it spouted to the height of 60 fathoms. Most probably they only guessed by the eye, and on that account their calculation may be a little exaggerated; and, indeed, I doubt that ever the water was thrown up so high, though I am much inclined to believe, that it sometimes mounts more high than when we observed it. The force of the vapours that throw up this water is excessive; it not only prevents the stones that are thrown into the opening from sinking, but even throws them up to a very great height, together

with the water. I must not forget to mention a very curious circumstance:—When the bason was full of water, we placed ourselves before the sun in such a manner, that we could see our shadows in the water. Every one observed round the shadow of his own head, (though not round the heads of the others,) a circle of almost the same colours that compose the rainbow, and round this another bright circle. This most probably proceeded from the vapours exhaling from the water. I remember to have seen something similar to it when travelling in the summer, particularly in the meadows; and it is soonest observed when riding on horseback, or in a carriage, when you have your shadow on one side.

In these large springs the waters were hot in the highest degree, and tasted a little of sulphur; but in other respects were pure and clear. In the smaller springs in the neighbourhood the water was tainted; in some it was as muddy as that of a clay-pit, in others as white as milk; and yet there are a few springs where the water forces itself through a fire underneath as red as blood.

I have already observed, that near most of these springs and *hvers* there are baths, and are frequently visited by the natives. There are also in many places dry and sweating baths. Eggert Olafsen mentions one of these baths at Hunsevik in North Iceland; and I had the curiosity of seeing one of them at Kibsaarholt, not far from Skallholt: it consisted of a hut raised of earth, into which hot steams arose from many holes. Fahrenheit's thermometer, which was at 57 degrees in the open air, rose to 93 in the hut, whilst it was open; and

when it was placed in one of the little openings, the steam arose to 125.—*Sir Joseph Banks' Letters on Iceland.*

EARTHQUAKES.

EARTHQUAKES are unquestionably the most dreadful of the phenomena of Nature; and are not confined to those countries which, from the influence of climate, their vicinity to volcanic mountains, or any other similar cause, have been considered as more particularly subject to them. Their effects have often been felt in the British Isles, although not in so extensive and calamitous a degree.

The most remarkable earthquakes of ancient times are described by Pliny in his Natural History. Among the most extensive and destructive of these, was one by which thirteen cities in Asia Minor were swallowed up in one night. * Another which succeeded, shook the greater part of Italy. But the most extraordinary one described by him, happened during the consulate of Lucius Marcus and Sextus Julius, in the Roman province of Mutina. He relates, that two mountains felt so tremendous a shock, that they seemed to approach and retire with a most dreadful noise. They at the same time, and in the middle of the day, cast forth fire and smoke, to the dismay of the astonished spectators. By this shock, several

* In Blair's Grammar of Philosophy, it is suggested, that cities are chiefly affected, because they contain the greatest quantities of conducting metallic bodies; so also with rivers.

towns were destroyed, and all the animals in their vicinity killed. During the reign of Trajan, the city of Antioch was, together with a great part of the adjacent country, destroyed by an earthquake; and about three hundred years after, during the reign of Justinian, it was again destroyed, with the loss of 40,000 of its inhabitants. Lastly, after an interval of sixty years, that ill-fated city was a third time overwhelmed, with a loss of 60,000 souls.

The earthquake which happened at Rhodes, upwards of 200 years before the Christian era, threw down the famous Colossus, together with the arsenal, and a great part of the walls of the city. In the year 1182, the greater part of the cities of Syria and of the kingdom of Jerusalem were destroyed by a similar catastrophe; and in 1594 the Italian writers describe an earthquake at Puteoli, which occasioned the sea to retire 200 yards from its former bed.

The dreadful earthquake which happened in Calabria in 1638, is described by Father Kircher, who was at that time on his way to Sicily, to visit Mount Etna. In approaching the gulf of Charybdis, it appeared to whirl round, in such a manner as to form a vast hollow, verging to a point in the centre. On looking towards Etna, it was seen to emit large volumes of smoke, of a mountainous size, which entirely covered the whole island, and obscured from his view the very shores. This, together with the dreadful noise and sulphureous stench which was strongly perceptible, filled him with apprehensions that a still more dreadful calamity was impending. The sea was agitated,

covered with bubbles, and had altogether a very unusual appearance. The Father had scarcely reached the Jesuit's College, when he was stunned with a horrid sound, resembling that of an infinite number of chariots, driven fiercely forward, the wheels rattling and the thongs cracking. The tract on which he stood seemed to vibrate, as if he had been in the scale of a balance which still continued to waver. The motion soon becoming more violent, he was thrown prostrate on the ground. The universal ruin around him now redoubled his amazement. The crash of falling houses, the tottering of towers, and the groans of the dying, all contributed to excite emotions of terror and despair.

The great earthquake of 1755 extended over a tract of at least 4,000,000 of square miles. It appears to have originated beneath the Atlantic Ocean, the waves of which received almost as violent a concussion as the land. Its effects were even extended to the waters in many places where the shocks were not perceptible. It pervaded the greater portions of the continents of Europe, Africa, and America; but its extreme violence was exercised on the south-western parts of the former.

Lisbon, the Portuguese capital, had already suffered greatly from an earthquake in 1531; and, since the calamity about to be described, has had three such visitations, in 1761, 1765, and 1772, which were not however attended by equally disastrous consequences. In the present instance, it had been remarked, that, since the commencement of the year 1750, less rain had fallen than had been known in the memory of the oldest of their

inhabitants, unless during the spring preceding the calamitous event. The summer had been unusually cool, and the weather fine and clear for the last forty days. At length, on the 1st of November, about forty minutes past nine in the morning, a most violent shock of an earthquake was felt; its duration did not exceed six seconds; but so powerful was the concussion, that it overthrew every church and convent in the city, together with the royal palace and the magnificent opera-house adjoining to it; in short, not any building of consequence escaped. About one-fourth of the dwelling-houses were thrown down; and, at a moderate computation, 30,000 individuals perished.

The first shock was extremely short, but was quickly succeeded by two others; and the whole generally, described as a single shock, lasted from five to seven minutes. About two hours after, fires broke out in three different parts of the city; and this new calamity prevented the digging out of the immense riches concealed beneath the ruins. From a perfect calm, a fresh gale immediately after sprung up, and occasioned the fire to rage with such fury, that in the space of three days the city was nearly reduced to ashes. Every element seemed to conspire towards its destruction; for soon after the shock, which happened near high-water, the tide rose in an instant forty feet; and at the castle of Belem, which defends the entrance of the harbour, fifty feet higher than had been ever known. Had it not subsided as suddenly, the whole city would have been submerged. A large new quay sunk to an unfathomable depth, with several hundreds of persons, not one of the bodies

of whom was ever afterwards found. Before the sea thus came rolling in like a mountain, the bar was seen dry from the shore.

The great shock was succeeded, about noon, by another, when the walls of several houses which were still standing were seen to open from the top to the bottom, more than the fourth of a yard, and afterwards to close again, so exactly as not to leave any signs of the injury. Between the 1st and 8th of November, twenty-two shocks were reckoned.

This earthquake was also felt at Oporto, Cadiz, and other parts of Europe, and equally severe in Africa. A great part of the city of Algiers was destroyed. In many places of Germany the effects of this earthquake were very perceptible; but in Holland the agitations were still more remarkable. The agitation of the waters was also perceived in various parts of Great Britain and Ireland. At Cobham in Surrey; Dunstall in Suffolk; Earsey Court in Berkshire; Eaton Bridge, Kent; and at many other places, the waters were variously agitated. At Shireburne Castle, Oxfordshire, a little after ten in the morning, a very strange motion was observed in the water of a moat which encompasses the building. Similar instances occurred at Loch Lomond and Loch Ness in Scotland. At Kinsale in Ireland, and all along the coast to the westward, many similar phenomena were observed. Shocks were also perceived in several parts of France, as at Bayonne, Bourdeaux, and Lyons; and commotions of the waters were observed at Angoulesme, Belleville, Havre de Grace, &c. but not attended with any remarkable circumstances.

At sea, the shocks of this earthquake were felt

most violently. Among other catastrophes, the captain of the Nancy frigate, off St Lucar, felt his ship so violently shaken, that he thought she had struck the ground; but on heaving the lead, found she was in a great depth of water.

The earthquakes in Sicily and the two Calabrias began on the 5th of February 1783, and continued until the latter end of the May following; doing infinite damage, and exhibiting at Messina, in the parts of Sicily nearest to the continent, and in the two Calabrias, a variety of phenomena. The earth was in a constant tremor, and its motions were various, being either vertical or whirling round, horizontal or oscillatory; that is, by pulsations or beatings from the bottom upwards. There were many openings, or cracks in the earth; and several hills had been lowered, while others were quite level. In the plains, the chasms were so deep that many roads were rendered impassible. Huge mountains were severed, and portions of them driven into the valleys, which were thus filled up. The total amount of the mortality occasioned by these earthquakes in Sicily and the two Calabrias, was, agreeably to the official returns, 32,367; but Sir William Hamilton thought it still greater, and carries his estimation to 40,000, including foreigners. The shocks felt since the commencement of these formidable earthquakes amounted to several hundreds; and among the most violent may be reckoned the one which happened on the 28th of March. It affected most of the higher parts of Upper Calabria, and the inferior part of Lower Calabria, being equally tremendous with the first. Indeed these shocks were the only ones sensibly felt in the capital, Naples. With relation to the

former, two singular phenomena are recorded. At a distance of about three miles from the ruined city of Oppido, in Upper Calabria, was a hill, having a sandy and clayey soil, nearly 400 feet in height, and nearly 900 feet in circumference at its base. This hill is said to have been carried to the distance of about four miles from the spot where it stood, into a plain called Campodi Bassano. At the same time, the hill on which the city of Oppido stood, and which extended about three miles, divided into two parts, being situated between two rivers, its ruins filled up the valley, and stopped their course, forming two large lakes, which augmented daily.—*Shaw's Nature Displayed.*

EARTHQUAKES—PHENOMENA WHICH PRECEDE AND ACCOMPANY THEM.

An earthquake happened here at Oxford, September 17th, 1683. The rarity of such effects make many people not know what they are; and, by heightening their surprise, imposes upon their judgments. One fancied it to be the falling of something about his house; another the tumbling of wood; a third the rattling of a cart; one, one thing, and one another, till either a mature deliberation, or intelligence from other hands, convinced them to the contrary, and satisfied them it was an earthquake. Besides, the short continuance of the trembling would hardly permit them to make any accurate observation.

I, for my part, perceived the sound and motion very plainly; and though, when I saw the clear-

ness of the morning, I judged that to be an earthquake, which otherwise I might have thought to have been only a distant thunder, yet had I not so clear an impression of it in my mind, as to make any considerable observations of my own; so that what I can afford you will be only some occasional reflections upon earthquakes in general, and remarks upon the intelligence which I have picked up here and there, concerning this in particular.

1. This earthquake happened at a time in which such effects are commonly experienced, if we may credit Aristotle, who tells us, that they are most frequently, though not always, in spring and autumn, in which there is generally a greater abundance of moisture sucked up, more vapours, and a larger quantity of nitre (as experience doth demonstrate), all which ingredients may conspire to the producing of an earthquake: For if we consider how capable they are of a large expansion, how forcible they are when rarified in vessels, closed and placed over the fire in *Æliopyles*, from which they break out with forcible blasts, or in winds, which frequently proceed from the rarefaction of such principles, we may suppose that those vapours which produce such great commotions in the air, may cause a considerable disturbance in the earth, when pent and locked up by cold, or any such accident.

2. The latter part of the week in September was so rainy, that most people were apprehensive of a flood; and upon Sunday the 9th of September, there fell some very considerable showers in the afternoon; but from that time it cleared up, and, to the end of the next week, continued very

warm and pleasant weather. The evening of Sunday the 16th was inclinable to frost, and the next morning it was found to be a very hard frost for the season; and then, about seven of the clock, the day being very clear and calm, the earthquake happened.

3. The quicksilver in the barometer (as I am told by the operator in chemistry here) stood as high then as at any time these three years, which, together with a remarkable calmness of the air, a matter generally looked upon as one of the circumstances which accompany earthquakes, and by many reckoned among the signs which forerun them, may be sufficient to show how free the air was from vapours at that time; and surely the fewer they were above, the more may be supposed below.

4. *Ignes fatui* were frequently seen a few days before this earthquake happened; which may pass for a probable argument, at least, to show how full the earth was then of damps and exhalations, since a stench that hath tainted well-water after an unusual manner, hath, upon the same account, been generally reckoned amongst the signs of an earthquake, by which it may be predicted: For by this it was that Pherecydes is said to have presaged the earthquake of Lacedemon; and Helmont mentions another who pretended to the same foresight, by tasting the water of a very deep well in the castle of Lovain.

5. The motion of this earthquake was not of that sort, which are termed Pulses or Successions, such as strike the ground at right angles with a violent shock, or intermittent knocking, so as oftentimes to raise the earth to a considerable

height, or force their way by a breach; but it appeared rather to be such a trembling motion as vibrates and shakes without altering the position of the earth, and leaves all things in the same posture in which it found them. For it shook the earth with a tremulous and vibrating motion, whose reciprocations were repeated with a great deal of quickness. The pulses were, as I could perceive, a little discontinued, and yet they came so thick, that I could not count them, though the whole earthquake continued here scarce more than six seconds of time; and when that ended, the *Motus Restitutionis*, or settling of the building in which I was, did seem to be with a crash.

6. Now, as trembling and vibrating motions are proper to produce sounds, so was this earthquake accompanied with a hollow murmuring sound, like distant thunder, as I have observed before; which sound kept time so exactly with the motion, and was so conformable to it in all respects, that it plainly appears there was the same reason for both.

We have earthquakes here very seldom; not one before for almost a score of years, except that which is doubtfully reported to have happened about four o'clock in the same morning. But seeing the earth abounds with such great variety of matter, which may produce them, as also with so many caverns and chinks of such various figures, through which they may be agitated with such different motions, it seems more easy to show how they may begin, how they may be carried on, how they may produce such different effects, and how they may continue, than to determine why they

should happen so rarely, do no more mischief, or be stopped so soon in their motion.—*Phil. Trans. Vol. II.*

THE GREAT DESERT—ITS PASSAGE.

We continued marching on in great haste, for fear of being overtaken by the four hundred Arabs, whom we wished to avoid. For this reason, we never kept the common road, but passed through the middle of the desert, marching through stony places, over easy hills. This country is entirely without water; not a tree is to be seen in it; not a rock which can afford a shelter or a shade. A transparent atmosphere, an intense sun, darting its beams upon our heads, a ground almost white, and commonly of a concave form, like a burning glass; slight breezes scorching like a flame. Such is a faithful picture of this district, through which we were passing. Every man we meet in this desert is looked upon as an enemy. Having discovered about noon, a man in arms on horseback, who kept at a certain distance, my thirteen Bedouins united the moment they perceived him, darted like an arrow to overtake him, uttering loud cries, which they interrupted by expressions of contempt and derision; as, "*What are you seeking, my brother? Where are you going, my son?*" As they made these exclamations, they kept playing with their guns over their heads. The discovered Bedouin profited of his advantage, and fled into the mountains, where it was impossible to follow him. We met no one else.

We had now neither eaten nor drank since the preceding day; our horses and other beasts were equally destitute; though ever since nine in the evening we had been travelling rapidly. Shortly after noon, we had not a drop of water remaining, and the men, as well as the poor animals, were worn out with fatigue. The mules, stumbling every moment, required assistance to lift them up again, and to support their burthen till they rose. This terrible exertion exhausted the little strength we had left.

At two o'clock in the afternoon, a man dropped down stiff, as if dead, from great fatigue and thirst. I stopt with three or four of my people to assist him. The little wet which was left in one of the leathern budgets, was squeezed out of it, and some drops of water poured into the poor man's mouth, but without any effect. I now felt that my own strength was beginning to forsake me; and becoming very weak, I determined to mount on horseback, leaving the poor fellow behind. From this moment others of my caravan began to drop successively, and there was no possibility of giving them any assistance; they were abandoned to their unhappy destiny, as every one thought only of saving himself. Several mules with their burdens were left behind, and I found on my way two of my trunks on the ground, without knowing what was become of the mules that had been carrying them, the drivers having forsaken them, as well as the care of my effects and of my instruments.

I looked upon this loss with the greatest indifference, as if they had not belonged to me, and pushed on. But my horse began now to tremble under me, and yet he was the strongest of the

whole caravan. We proceded in silent despair. When I endeavoured to encourage any one of the party to increase his pace, he answered me by looking steadily at me, and by putting his forefinger to his mouth, to indicate the great thirst by which he was affected. As I was reproaching our conducting officers for their inattention, which had occasioned this want of water, they excused themselves, by alleging the mutiny of the *Oudaias*; and besides, added they, "Do we not suffer like the rest?" Our fate was the more shocking, as every one of us was sensible of the impossibility of supporting the fatigue to the place where we were to meet with water again. At last, at about four in the evening, I had my turn, and fell down with thirst and fatigue.

Extended without consciousness on the ground, in the middle of the desert, left only with four or five men, one of them had dropt at the same moment with myself, and all without any means of assisting me, because they knew not where to find water, and if they had known it, had not strength to fetch it, I should have perished with them on the spot, if Providence, by a kind of miracle, had not preserved us.

Half an hour had already elapsed, since I had fallen senseless to the ground, (as I have since been told), when, at some distance, a considerable caravan, of more than two thousand souls, was seen advancing. It was under the direction of a *Marebout*, a saint called Sidi Alarbi, who was sent by the sultan to Hemsen or Tremesin. Seeing us in this distressed situation, he ordered some skins of water to be thrown over us. After I had received several of them over my face and hands,

I recovered my senses, opened my eyes, and looked around me, without being able to discern any body. At last, however, I distinguished seven or eight sherifs and fakeers, who gave me their assistance, and shewed me much kindness. I endeavoured to speak to them, but an invincible knot in my throat seemed to hinder me ; I could only make myself understood by signs, and by pointing to my mouth with my finger.

They continued pouring water over my face, arms, and hands, and at last I was able to swallow small mouthfulls. This enabled me to ask, "*Who are you?*" When they heard me speak, they expressed their joy, and answered me, "*Fear nothing; far from being robbers, we are your friends,*" and every one mentioned his name. I began by degrees to recollect their faces, but was not able to remember their names. They poured again over me a still greater quantity of water, gave me some drink, filled some of my leather bags, and left me in haste, as every minute spent in this place was precious to them, and could not be repaired.

This attack of thirst, is perceived all of a sudden, by an extreme aridity of the skin; the eyes appear to be bloody; the tongue and mouth, both inside and outside, are covered with a crust of the thickness of a crown piece. This crust is of a dark yellow colour, of an insipid taste, and of a consistence like the soft wax from a bee-hive. A faintness or languor takes away the power to move ; a kind of knot in the throat and diaphragm, attended with great pain, interrupts respiration. Some wandering tears escape from the eyes, and at

last the sufferer drops down to the earth, and in a few moments loses all consciousness. These are the symptoms which I remarked in my unfortunate fellow-travellers—and which I experienced myself.

I got with difficulty on my horse again, and we proceeded on our journey. My Bedouins, and my faithful Salem, were gone in different directions to find out some water, and two hours afterwards they returned, one after another, carrying along with them some good or bad water, as they had been able to find it; every one presented to me part of what he had brought; I was obliged to taste it, and I drank twenty times, but as soon as I swallowed it, my mouth became as dry as before; at last I was not able either to spit or to speak.

The greatest part of the soil of the desert consists of pure clay, except some small traces of a calcareous nature. The whole surface is covered with a bed of chalky calcareous stone, of a whitish colour, smooth, round, and loose, and of the size of the fist; they are almost all of the same dimensions, and their surface is carious like pieces of old mortar; I look upon this to be a true volcanic production. This bed is extended with such perfect regularity, that the whole desert is covered with it, a circumstance which makes pacing over it very fatiguing to the traveller.

Not any animal is to be seen in this desert, neither quadrupeds, birds, reptiles, nor insects, nor any plant whatever; and the traveller who is obliged to pass through it, is surrounded by the silence of death. It was not till four in the evening, that we began to distinguish some small plants, burnt

with the sun, and a tree of a thorny nature, without either blossom or fruit.—*Ali Bey's Travels in Morocco, Tripoli, &c.*

REMARKABLE FOUNTAINS.

One of the most remarkable fountains of ancient times, was one of which Herodotus and Diodorus Siculus have transmitted an account. It was called, "The Fountain of the Sun," and was situated near the Temple of Jupiter-Ammon. At the dawn of day, this fountain was warm; as the day advanced, it became progressively cool; at noon it was at the extremity of cold; at which time the Ammonians made use of it to water their gardens and shrubberies. At the setting of the sun, it became again warm; and continued to increase as the evening proceeded, until midnight, when it reached the extremity of heat; as the morning advanced, it grew progressively cold.

There was a fountain also equally curious in the Forest of Dodona. It is said to have had the power of lighting a torch; at noon, it was dry; at midnight full; from which time it decreased till the succeeding noon. A similar one is mentioned as being near Grenoble.

The celebrated Castalian fountain rushes from two precipitate rocks, and forms several romantic cascades; and Cashmere is said to abound in fountains, which the natives call miraculous. Pliny the Younger describes one near the Larian lake, which increased and decreased three times every day. It still exists

The ancients were never weary of attributing peculiar properties to fountains. That of Arathusa was supposed to have the power of forming youth to beauty; and that of Colophon, of enabling the priest of the Clavian Apollo to foretel future events. This oracle was visited by Germanicus in his progress through Ionia. The priest inquired his name; then, descending into a cavern in which the secret spring was, he drank of it; and, returning to Germanicus, recited two or three verses, which foretold the premature death of that illustrious prince. Pliny mentions this spring, and asserts, that whoever drank of it died soon after.

Of medicinal and detrimental fountains, we have many instances, vouched by writers, modern as well as ancient. Philostratus mentions one that occasioned the leprosy; Vitruvius speaks of another near Zama, in Numidia, that gave unwonted loudness to the voice. We read of some that caused immediate death, some the loss of memory, and others that restored it. Plutarch relates, that there was one called *Ciffusa*, which, being of a bright colour, and of an exceedingly pleasant taste, the inhabitants of the neighbourhood believed that Bacchus had been washed in it immediately after his birth. Many of them have doubtless a fabulous origin, yet it would be too presuming to doubt the absolute possibility of their existence. In Epirus was a fountain which, at the last quarter of the moon, was so much impregnated with sulphur, that it kindled any wood that was put into it. And in the palatinate of Cracow, there is a spring, which, upon applying a torch, flames like spirits of wine. This flame dances on the water, but it does not heat it. Pliny also speaks of two fountains, one

in Judea, the other in Æthiopia, which, being impregnated with sulphur, had the property of oil in respect to burning. The same property is given to a river in Cilicea, and a fountain near Carthage, by Vitruvius. Herodotus relates that, in the country of the Atarantes in Africa, was a hill of salt, on the summit of which bubbled a spring of fresh water. At Guilford, in Connecticut, is a fountain, the water of which will evaporate, if corked in a bottle ever so strictly. Some writers mention one rising in Mount Soractes, the waters of which boiled at the rising of the sun. In Greenland, most of the springs and fountains rise and fall with the tide. Many in Spain, in England and in Wales, have similar periodical returns; and under the rocks of Giggleswick, in the West Riding of Yorkshire, there is a well that ebbs and flows several times in the course of an hour. When the weather is very wet, or very dry, it ceases to flow.—*Bucke on the Beauties, Harmonies, and Sublimities of Nature.*

CURIOUS TREES.

The uses and virtues of the Bread-fruit tree are known to be exceedingly important, and yet it grows in Ceylon, and is little respected. In Guam, it grows larger than our apple-trees; when ripe, it is soft and yellow, and its taste is sweet. When full grown, the Guamans bake it, it having neither seed nor stone, but is a pure substance, like bread, and lasts in season eight months of the year.

In some parts of Norway, where vegetation is confined principally to moss and lichens, it has been discovered that even those vegetables may, with little trouble, be converted into bread, more palatable and nourishing than the bread of bark, to which the Norwegians have so long been accustomed.

But the greatest of all vegetable phenomena, though not so useful to mankind as the bread-fruit, appears to be the *Palo de Vaca.* This plant produces a glutinous liquid, like an animal. It frequently grows upon the sides of a rock, and has dry curiaceous leaves. For several months of the year, its foliage is not moistened by a single shower of rain, and its branches appear entirely dried up; but upon piercing the trunk, particularly at the rising of the sun, there flows a sweet and nourishing yellow juice, having a balsamic perfume, with many of the qualities of milk. In the morning, the natives of the country, in which this vegetable fountain grows, visit it with bowls, in which they carry home its milk for their children. So that this tree, says Baron Humboldt, seems to present the picture of a shepherd, distributing the milk of his flock. The Araguans call it the cow; the Caucaguans the milk-tree. It grows too in the country from Barbuta to the Lake Maracaïbo.

In the interior of Africa is a tree (Shea), which furnishes excellent butter. It resembles an American oak, and its fruit is not unlike the Spanish olive. It grows abundantly in Ashantee, and in the woods near Kabba. The vegetable butter which its kernel affords, is white, more firm, and in Parke's opinion, far better than that produced from cows. It has also the advantage of keeping

all the year without salt, even in that intensely hot country. The cream-fruit of Sierra Leone affords a similar saccharine fluid. Its flower resembles that of the vahea; its fruit that of the voacanga, of which the Madagascarenes make birdlime; and that of urceacla, which produces the caoutchou of Sumatra. These trees lessen the consequence of the cow very materially in these longitudes; but in some countries far more civilized, the natives seem to disdain to avail themselves even of that animal itself.

In some regions of America, Africa, and Asia, a liquid is exuded from the palm, which, by an easy process, is converted into wine. This species of palm is regularly tapped. In Congo, it yields plentifully at night, but not much in the day.

Between Table Bay and Bay False, near the Cape of Good Hope, there grows also, amid white sand, a shrub, the berries of which make excellent candles. This plant is well known in the Azores and America, where it is called the Candleberry-myrtle. Vegetable tallow grows also at Siac and Sumatra; while the bark of the quillai tree of China has many of the properties of soap.

In Chili there is a shrub called Thurania, which affords incense equal to that of Arabia. It exudes in the form of globules of tears, through pores of the bark. These globules are white and transparent, having a bitter taste, but an aromatic perfume. In that fine country, too, grows a species of wild basil, sixty miles from the sea, which, in a soil having no appearance of salt, is covered in the morning, from spring to winter, with saline globes, which the Chilians use as salt. In Mexico

there is a tree, the flower of which, before it has expanded, resembles the closed hand of a monkey; when unfolded, the open hand. From this circumstance is derived the name of *Chiranthodeadron*. Not long since there existed only one specimen of this tree in the known world. It grows and has flourished for many ages in *Toluca*, a city of Mexico, where it is esteemed sacred, and whither persons travel from great distances in order to procure its flowers. This was the only tree of its genus, previous to the year 1787, that was known to be in existence. But some botanists having visited Toluca in that year, they took slips, and planted them in the royal gardens in Mexico, where one of them took root, and had grown, in 1804, to the height of forty-five feet. The Talipot of Ceylon grows to the height of one hundred feet, and its leaf is so large that it will cover from sixteen to twenty men like an umbrella. But the largest leaved plant in the world is the Troolie of Surinam. It extends on the ground, and has frequently been known to attain a width of three feet, and a length of thirty. The natives cover their houses with it, and it is very durable.

Ives says, in his Voyage to India, that he saw a Banyan, near Trevan de Parum, able to shelter ten thousand men; and Dr Fryer alludes to some so large as to shade thirty thousand horse and men singly. On an island in the Nerbudda, a few miles from Baroach, grows one more remarkable than any other in India. Travellers call it the "Wonder of the vegetable world," being two thousand feet in circumference. Armies may encamp under its branches. The Hindoos esteem it the symbol of a prolific deity; and British officers frequently

in their excursions, live many weeks together under its canopy. The Capot is the only tree that can be compared to the Banyan; and Bosman relates, that he saw one on the Gold Coast of Guinea which was so large that it would shade twenty thousand men at least.

We may here say a few words relative to the ages of trees. Franklin mentions two Cypresses which the Persians believed to be six hundred years old. Chardin mentions a Plane tree of a thousand years. Forbes says, that he smoked his nookha under the very banyan beneath which part of Alexander's cavalry took shelter; and the age of the oaks of Lebanon is said to be at least two thousand years.—*Bucke on the Beauties, Harmonies, and Sublimities of Nature.*

VEGETABLE INSTINCT.

INSTINCT is a particular disposition or tendency in a living being to embrace, without deliberation or reflection, the means of self-preservation, and to perform, on particular occasions, such other actions as are required by its economy, without having any perception for what end or purposes it acts, or any idea of the utility and advantage of its own operations. Climbing plants afford a curious instance of this instinctive economy. Some of these having very slender stems, cannot, like most other plants, grow of themselves in a perpendicular direction; but in order to compensate for this incapacity, nature has given them the power of mov-

ing or twining their branches and tendrils different ways, until they generally meet with a tree or some other body on which to climb, or attach themselves; and when a tendril has laid hold of a support, it coils up and draws the stem after it.

Trees and other vegetables have likewise the power of directing their roots for procuring nourishment;—for instance, a tree growing near a ditch, will be found to direct its roots straight downwards, on the side next the ditch, until they reach the ground below it, when they will throw off fibres underneath, and ramify like the root on the other side of the tree. Some curious examples of this kind of instinct are related by Lord Kames, among which is the following. "A quantity of fine compost for flowers happened to be laid at the foot of a full grown elm, where it lay neglected three or four years; when moved, in order to be carried off, a network of elm fibres spread through the whole heap; and no fibres had before appeared at the surface of the ground."

Many flowers also fold up their leaves on the approach of rain, or in cold cloudy weather, and unfold them again when cheered by the reanimating influence of the sun. This is remarkably exemplified in the *convolvulus arvensis, anagallis arvensis,* and many others, but more particularly in the last, whence it has been called the poor man's weather-glass.

In Watson's Chemical Essays also, it is stated that trefoil, wood-sorrel, mountain ebony, the African marigold, and many others, are so regular in folding up their leaves before rainy weather, that these motions have been considered as a kind of

instinct similar to that of ants.—*Tupper on the Probability of Sensation in Vegetables.*

Some plants open their petals to receive rain, others avoid it; some contract at the approach of a storm, others on the approach of night; while some expand and blossom only to the evening air.

Near the Cape, certain flowers form a species of chronometer. The *morea unguiculata* and *undulata* open at nine in the morning, and close at four; the *ixia cinnamonea* opens at the time the other closes, and sheds a delicious perfume throughout the night.

The stamina of the flowers of sorrel thorn are so peculiarly irritable, that when touched, they will incline almost two inches; and the upper joint of the leaf of the *dionæa* is formed like a machine to catch food. When an insect therefore settles on its glands, the tender parts become irritated, and the two lobes rise up, grasp the insect, and crush it to death. The *plane-tree* exhibits the power of exercising a sagacity for securing food not unworthy of an animal. Lord Kaimes relates, that among the ruins of New Abbey, in the county of Galloway, there grew in his time, on the top of one of its walls, a plane-tree upwards of twenty feet in height. Thus situated, it became straitened for food and moisture, and therefore gradually directed its roots down the side of the wall, till they reached the ground at the distance of ten feet. When they had succeeded in this attempt, the upper roots no longer shot out fibres, but united in one; and shoots vigorously sprung up from the root which had succeeded in reaching the earth.

The Island of St Lucia presents a still more curious phenomenon in the animal flower. This organization lives in a large bason, the water of which is brackish. It is more brilliant than the marygold, which it resembles. But when the hand is extended towards it, it recoils, and retires like a snail into the water. It is supposed to live on the spawn of fish.

In Java grows a plant, the *Nepenthes distillatoria*, remarkable for having a small vegetable bag attached to the base of its leaves. This bag is covered with a lid which moves on a strong fibre, answering the purpose of a hinge. When dews rise, or rains descend, this lid opens; when the bag is saturated, the lid falls and closes so tightly, that no evaporation can take place. The moisture thus imbibed cherishes the seed, and is gradually absorbed into the body of the plant.—*Bucke's Beauties, Harmonies, and Sublimities of Nature.*

COAL.

Coal, in greater or less quantities, is found in most countries, at various elevations, (but almost all the great deposites are in low situations), in beds lying over each other of various thicknesses, having between them beds of stony or earthy matters; and it is remarkable that, though these beds of coal are nearly horizontal, they are never quite so, but sink near the middle, so that a section would give the idea of a cup or basin.

The coal-mines of Whitehaven may be considered as the most extraordinary in the known world. They are excavations which have in their

structure a considerable resemblance to the gypsum quarries of Paris; and are of such a magnitude and extent, that, in one of them alone, a sum exceeding half a million sterling was, in the course of a century, expended by the proprietors. Their principal entrance is by an opening at the bottom of a hill, through a long passage hewn in the rock, leading to the lowest vein of coal. The greatest part of this descent is through spacious galleries, which continually intersect other galleries, all the coal being cut away, with the exception of large pillars, which, where the mine runs to a considerable depth, are nine feet in height, and about thirty-six feet square at the base. Such is the strength there required to support the ponderous roof.

The mines are sunk to the depth of one hundred and thirty fathoms, and are extended under the sea, to places where there is above them sufficient depth of water for ships of large burden. These are the deepest coal-mines which have ever been wrought; and perhaps the mines have not, in any other part of the globe, penetrated to so great a depth beneath the surface of the sea, the very deep mines in Hungary, Peru, and elsewhere, being situated in mountainous countries, where the surface of the earth is elevated to a great height above the level of the sea.

In these mines there are three strata of coal, which lie at a considerable distance, one above the other, and are made to communicate by pits; but the vein is not always continued in the same regularly inclined plane, the miners frequently meeting with hard rock, by which their further progress

is interrupted. At such places there seem to have been breaks in the earth, from the surface downward, one portion appearing to have sunk down, while the adjoining part has preserved its ancient situation. In some of these places the earth has sunk twenty fathoms, and even more, while in others the depression has been less than one fathom. These breaks the miners call dykes; and, when they reach one of them, their first care is to discover whether the strata in the adjoining part are higher or lower than in the part where they had been working, or, according to their own phrase, whether the coal be cast down or cast up. In the former case they sink a pit; but, if it be cast up to any considerable height, they are frequently obliged, with great labour and expense, to carry forward a level or long gallery, through the rock, until they again reach the strata of coal.

The total annual consumption of pit-coal in England is stated to be 23,669,400 tons. A ton is about a cubic yard; and, taking one yard in thickness as the basis of calculation, it will give 305 yards per square mile of annual supply. And, supposing the coal to extend throughout the whole sub-surface of the country, then the whole quantity would be exhausted in about 10,000 years. But, recent observations in some of the Staffordshire mines have shown, that, where some of them have been worked out, the workmen have only to work lower, and they find stratum below stratum, beyond all conjecture where they will stop. Thus we might furnish all the world for a thousand years with coals without fear of exhaustion.—*Shaw's Nature Displayed.*

IRON-MINE IN SWEDEN.

For grandeur of effort, filling the mind of the spectator with a degree of wonder, which amounts to awe, there is no place where human labour is exhibited under circumstances more tremendously striking. As we draw near to the wide and open abyss, a vast and sudden prospect of yawning caverns and prodigious machinery prepared us fo the descent. We approached the edge of the dreadful gulf, whence the ore is raised, and ventured to look down; standing on the verge of a sort of platform, constructed over it in such a manner as to command a view into the great opening, as far as the eye could penetrate amidst its gloomy depths; for, to the sight, it is bottomless. Immense buckets, suspended by rattling chains, were passing up and down; and we could perceive ladders scaling all the inward precipices on which the work people, reduced by their distance to pigmies in size, were ascending and descending. Far below the utmost of these figures a deep and gaping gulf, the mouth of the lowermost pits was by its darkness rendered impervious to the view. From the spot where we stood down to the place where the buckets are filled, the distance might be about seventy-five fathoms; and, as soon as any of these buckets emerged from the gloomy cavity we have mentioned, or until they entered into it, in their descent they were visible; but, below this point they were hid in darkness. The clanking of the chains, the groan-

ing of the pumps, the halooing of the miners, the creaking of the blocks and wheels, the trampling of horses, the beating of the hammers, and the loud and frequent subterraneous thunder from the blasting of the rocks by gunpowder, in the midst of all this scene of excavation and uproar, produced an effect which no stranger can behold unmoved. We descended with two of the miners and our interpreter into this abyss. The ladders, instead of being placed like those in our Cornish mines, on a series of platforms as so many landing places, are lashed together in one unbroken line, extending many fathoms; and, being warped to suit the inclination or curvature of the sides of the precipices, they are not always perpendicular, but hang over in such a manner, that, even if a person held fast by his hands, and if his feet should happen to slip, they would fly off from the rock, and leave him suspended over the gulf. Yet such ladders are the only means of access to the works below; and, as the labourers are not accustomed to receive strangers, they neither use the precautions, nor offer the assistance usually afforded in more frequented mines. In the principal tin-mines of Cornwall, the staves of the ladders are alternately bars of wood and iron; here they were of wood only, and in some parts rotten and broken, making us often wish, during our descent, that we had never undertaken an exploit so hazardous. In addition of the danger to be apprehended from the damaged state of the ladders, the staves were covered with ice or mud; and thus rendered so cold and slippery, that we could have no dependence on our benumbed fingers if our feet

failed us. Then to complete our apprehension, as we mentioned this to the miners, they said, "Have a care, it was just so talking about the staves, that one of our women fell about four years ago as she was descending to her work." "Fell!" said our Swedish interpreter rather simply, "and, pray, what became of her?" "*Became of her!*" continued the foremost of our guides, disengaging one of his hands from the ladder, and slapping it forcibly against his thigh, as if to illustrate the manner of the catastrophe—"*she became a pancake.*"

As we descended further from the surface, large masses of ice appeared covering the sides of precipices. Ice is raised in the buckets with the ore and rubble of the mine. It has also accumulated in such quantity in some of the lower chambers, that there are places where it is fifteen fathoms thick, and no change of temperature above prevents its increase. This seems to militate against a notion, now becoming prevalent, that the temperature of the air in mines increases directly as the depth from the surface, owing to the increasing temperature of the earth under the same circumstances, and in the same ratio. But it is explained by the width of the aperture at the mouth of this mine, which admits a free passage of atmospheric air. In our Cornish mines, ice would not be preserved in a solid state at any considerable depth from the surface.

After much fatigue, and no small share of apprehension, we at length reached the bottom of the mine. Here we had no sooner arrived, than our conductors, taking each of us by an arm, hurried us along through regions of "thick ribbed

ice" and darkness, into a vaulted level, through which we were to pass into the principal chamber of the mine. The noise of countless hammers, all in vehement action, increased as we crept along this level; until at length, subduing every other sound, we could no longer hear each other speak, notwithstanding our utmost efforts. At this moment we were ushered into a prodigious cavern, whence the sounds proceeded; and here, amidst falling waters, tumbling rocks, steam, ice, and gunpowder, about fifty miners were in the very height of their employment. The magnitude of the cavern, over all parts of which their labours was going on, was alone sufficient to prove that the iron ore is not deposited in veins, but in beds. Above, below, on every side, and in every nook of this fearful dungeon, glimmering tapers disclosed the grim and anxious countenances of the miners. They were now driving bolts of iron into the rocks, to bore cavities for the gunpowder for blasting. Scarcely had we recovered from the stupefaction occasioned by our first introduction into this *Pandæmonium*, when we beheld close to us hags more horrible than perhaps it is possible for any other female figures to exhibit, holding their dim, quivering tapers to our faces, and bellowing in our ears. One of the same sisterhood, snatching a lighted splinter of deal, darted to the spot where we stood, with eyes inflamed and distilling rheum, her hair clotted with mud, dugs naked and pendulous, and such a face, and such hideous yells, as it is impossible to describe. If we could have heard what she said, we should not have comprehended a syllable; but as several others, equally *Gorgonian* in their aspect, passed swiftly by us,

hastening tumultuously towards the entrance, we began to perceive, that if we remained longer in our present situation, *Atropos* might cut short the threads of our existence: for the noise of the hammers had now ceased, and a tremendous blast was near the point of its explosion. We had scarcely retraced with all speed our steps along the level, and were beginning to ascend the ladders, than the full volume of the thunder reached us, and seemed to shake the earth itself with its terrible vibrations.—*Dr Clarke's Travels.*

HERCULANEUM.

THE ancient city of Herculaneum, which was in the year 79 swallowed up by an earthquake, is now under the town of Portici, a quarter of a mile from the sea at the foot of Vesuvius. It was discovered by accident. A peasant sinking a well in his garden, found several fragments of marble. The Prince d'Elbreuf being informed of the circumstance purchased the spot, and, continuing the excavations, discovered various statues, pillars, and even a whole temple of the finest marble adorned with statues. The Neapolitan government then interposed, and suspended all further excavations for the space of twenty years, at which time, instead of satisfying the public curiosity, and doing itself immortal honour, by purchasing the buildings and village above, and laying open the whole city below, it bought the ground, but with characteristic stupidity resolved to cover it with a palace. The excavations were indeed continued occasion-

ally, but negligently, and rather for the purpose of profit than of liberal curiosity. However, a basilica, two temples, and a theatre, were successively discovered, and stripped of their numerous pillars and statues. Streets were observed, paved and flagged on the sides, and private houses, and even monuments explored. A prodigious number of statues of bronze, of different sizes; pillars of marble and alabaster; and paintings and mosaics, many entire and in high preservation, others fractured and damaged, have been drawn from the edifices of this subterraneous city, and give a high idea of its opulence. To these we may add every species of ornament used in dress, of weapons and armour, of kitchen utensils and domestic furniture, of agriculture and chirurgical instruments. More treasures might, without doubt, be extracted from this long-forgotten mine of antiquity; but the almost inconceivable indifference of the Spanish courts, and the indolence with which the excavations have been carried on, as well as the manner, which is more influenced by a regard for the safety of the heavy useless modern palace, than by any considerations of curiosity and interest in the ancient city, have hitherto, in spite of public eagerness, checked, or rather suspended, the undertaking. At present, the theatre is the only part open to inspection; the descent is by a long flight of stairs, wide and inconvenient; but the darkness below is too deep to be dispelled by the feeble glare of a few torches; and some of the seats for the spectators, and the front of the stage, are the only objects distinguishable. The other excavations are filled up, as the method is to open only one at a time, always filling that which is abandoned with

the rubbish drawn from that which is newly opened.—*Eustace's Classical Tour through Italy.*

Among the valuable antiquities that have been excavated, it may be worth while to mention the following.

A splendid picture, eight palms broad by nine high, representing Theseus after having killed the Minotaur. The figure of Theseus is naked, and standing, and cannot so properly be resembled to any thing as to the Antinous of the Belvidera, both for the attitude and the air of the head. It is drawn and coloured with astonishing elegance. The Greek boys, who are represented as returning him thanks for their deliverance, seem, for their novel simplicity, the work of Dominichino; and the composition of the whole is worthy of Raphael.

Two antique paintings, about twelve feet square, were taken out of the ruins, with their frames or borders round them, as fresh and perfect as if done yesterday; much more so, indeed, than some of Raphael's in the Vatican, and, for excellence and fine taste, they exceed any thing I have ever seen. One of these is called the *Pomona*, because, among other figures, there is a woman sitting crowned with fruits and blossoms. The other is Theseus, having just killed the Minotaur, who lies dead at his feet; a figure of a youth is kissing his right hand; Ariadne, and another figure, stand at his left. Both these figures are as large as life.

Many statues were dug up, but not above one or two tolerably good. There is, however, a perfect bust of *Agrippina*, the mother of Nero, which was found standing in its niche; it is as

clean as if just finished, has not the least damage, and is equal to most things of that kind in the world. I should not hesitate to say, it is altogether as fine a portrait as the Caracalla of the Farnese.

Several antique rings, with cameos and intaglios set in them; a fork and silver spoon, made in the handle like a modern one, with the bowl pointed like an olive leaf; a case of surgeon's instruments several kitchen utensils; mouse-traps, vessels o rice, &c.—*Philosophical Transactions.*

"A long suburban line of buildings, some shattered and miserable, (the abodes of the people) others spacious but deserted, (the villas of the nobles), leads to the royal palaces of Portici by the village of Resina—the first stage in this journey o wonders, at which taste or curiosity is induced t stop, for the streets of Resina cover the buried ruins of Herculaneum. A mass of formless buildings, inhabited by dingy, dirty beings, are sunk t the right of the road, where the visitor descend from his carriage, and is met by the grim gaun guide of Herculaneum, who, having distributed candle to each of the party, and furnished himsel with many, proceeds by a cavernous aperture i the earth, to descend the sloping surface betwee its black and gloomy walls, over which so many centuries have passed. A descent of eighty palm (for it is said that seven layers of lava lie betwee the soil of Herculaneum and Resina) leads to th subterranean defile, where there is so little to see and so much to sadden. The terror lest the light should be extinguished in this dark tomb, increased by the caution with which the experience

guide multiplies illumination, by sticking a candle here and there against the lava walls, as he proceeds, as land-marks to return by—the dim glimmer of these distant lights, as the winding of the narrow labyrinth is followed, with a thousand horrors conjured up by the impression of darkness, leave on the mind of the nervous and fanciful, but one dominant feeling—the desire of returning to daylight and fresh air. Little, indeed, is to be seen in Herculaneum, but the ruins of the amphitheatre, round whose orchestra the guide leads his protegés; but the whole is so partially excavated, and the darkness so impenetrable, that the view is indistinct, and the impression carried away incomplete. The monuments are, indeed, so buried in the lava, (which must have fallen in liquid floods, pouring into every space), that the most accurate idea which can be formed of this terribly preserved city, is that given by fossil forms impacted in their matrices. The sounds of the carriage wheels over our heads, as we reascended, driving through Resina, and the first ray of daylight, awakened the pleasantest sensations to which this visit to Herculaneum gave birth. Every reflection connected with it is terrible, and yet the villages built over it swarm with inhabitants who may, every time Vesuvius explodes, expect the same fate as the great city beneath has experienced.—*Lady Morgan's Italy.*

POMPEII.

THE distance from Naples to Pompeii is little more than ten English miles. Near the *Torre del*

Annunziata to the left, and amid hills planted with vineyards, the town itself, which, throwing off its shroud of ashes, came forth from its grave breaks on the view. The buildings are without roofs, which are supposed to have been destroyed by an enemy in an unguarded state, or torn off by a hurricane. The tracks of the wheels which anciently rolled over the pavement are still visible. An elevated path runs by the side of the houses for foot passengers; and, to enable them in rainy weather to pass more commodiously to the opposite side, large flat stones, three of which take up the width of the road, were laid at a distance from each other. As the carriages, in order to avoid these stones, were obliged to use the intermediate spaces, the tracks of the wheels are there most visible. The whole of the pavement is in good condition; it consists merely of considerable pieces of lava, which, however, are not cut, as at present, into squares, and may have been on that account the more durable.

The part which was first cleared is supposed to have been the main street of Pompeii; but this is much to be doubted, as the houses on both sides, with the exception of a few, were evidently the habitations of common citizens, and were small, and provided with booths. The street itself likewise is narrow: two carriages only could go abreast; and it is very uncertain whether it ran through the whole of the town; for, from the spot where the moderns discontinued digging, to that where they recommenced, and where the same street is supposed to have been again found, a wide tract is covered with vineyards, which may very well oc-

:upy the place of the most splendid streets and narkets, still concealed underneath.

Among the objects which attract a particular ttention, is a booth in which liquors were sold, nd the marble table within, which bears the marks f the cups left by the drinkers. Next to this is house, the threshold of which is inlaid with a alutation of black stone, as a token of hospitality. On entering the habitations, the visitor is struck y the strangeness of their construction. The mid- le of the house forms a square, something like he cross passages of a cloister, often surrounded y pillars: it is cleanly, and paved with party- oloured mosaic, which has an agreeable effect. n the middle is a cooling well, and on each side little chamber, about ten or twelve feet square, ut lofty, and painted with a fine red or yellow. The floor is of mosaic; and the door is made gene- ally to serve as a window, there being but one partment, which receives light through a thick lue glass. Many of these rooms are supposed to ave been bed-chambers, because there is an ele- ated broad step, on which the bed may have tood, and because some of the pictures appear ıost appropriate to a sleeping-room. Others are upposed to have been dressing-rooms, on this ac- ount, that on the walls a Venus is described, de- orated by the Graces, added to which little flasks nd boxes of various descriptions have been found ı them. The larger of these apartments served or dining-rooms; and in some are to be met with uitable accommodations for hot and cold baths.

The manner in which a whole room was heated s particularly curious. Against the usual wall, a

second was erected, standing at a little distanc from the first. For this purpose large square tile were taken, having, like our tiles, a sort of hook so that they kept the first wall, as it were, off fro them. A hollow space was thus left all aroun from the top to the bottom, into which pipes wer introduced, that carried the warmth into the cham ber, and as it were rendered the whole of the plac one stove. The ancients were also attentive t avoid the vapour or smell from their lamps. I some houses there is a niche made in the wall fo the lamp, with a little chimney in the form of funnel, through which the smoke ascended. Op posite to the house-door the largest room is pla ced. It is properly a sort of hall, for it has onl three walls, being quite open in the fore part. Th side-rooms have no connection with each other, bu are divided off like the cells of monks, the doo of each leading to a fountain.

Most of the houses consist of one such square surrounded by rooms. In a few, some decaye steps seem to have led to an upper story, whic is no longer in existence. Some habitations, how ever, probably belonging to the richer and mor fashionable, are far more spacious. In these a firs court is often connected with a second, and ever with a third, by passages; in other respects they are pretty similar to those above described. Many garlands of flowers and vine branches, and many handsome pictures, are still to be seen on the walls. The guides were formerly permitted to sprinkle these pictures with fresh-water in the presence of travellers, and thus revive their former splendour for a moment, but this is now strictly forbidden; and, indeed, not without reason, since

the frequent watering might at length totally rot away the wall.

One of the houses belonged to a statuary, whose workshop is still full of the vestiges of his art. Another appears to have been inhabited by a surgeon, whose profession is equally evident from the instruments discovered in his chamber. A large country-house near the gate undoubtedly belonged to a very wealthy man, and would, in fact, still invite inhabitants within its walls. It is very extensive, stands against a hill, and has many stories. Its finely decorated rooms are unusually spacious; and it has airy terraces, from which you look down into a pretty garden that has been now again planted with flowers. In the middle of this garden is a large fish-pond; and near that an ascent from which on two sides six pillars descend. The hinder parts are the highest, the middle somewhat lower, and the front the lowest. They appear, therefore, rather to have propped a sloping roof, than to have been destined for an arbour. A covered passage, resting on pillars, encloses the garden on three sides. It was painted, and probably served in rainy weather as an agreeable walk. Beneath is a fine arched cellar, which receives air and light by several openings from without; consequently, its atmosphere is so pure, that, in the hottest part of summer, it is always refreshing. A number of *amphoræ*, or large wine vessels, are to be seen here still leaning against the wall, as the butler left them when he fetched up the last goblet of wine for his master. Had the inhabitants of Pompeii preserved these vessels with stoppers, wine might still have been found in them; but as it was, the stream of ashes rushing in, of course

forced out the wine. More than twenty human skeletons of fugitives, who thought to save themselves here under ground, but who experienced a tenfold more cruel death than those suffered who were in the open air, were found within this cellar.

The destiny of the Pompeians must have been dreadful. It was not a stream of fire which encompassed their abodes; they could then have sought refuge in flight. Neither did an earthquake swallow them up; sudden suffocation would then have spared them the pangs of a lingering death. *A rain of ashes buried them alive* BY DEGREES! We will read the delineation of Pliny:—"A darkness suddenly overspread the country; not like the darkness of a moonless night; but like that of a closed room, in which the light is suddenly extinguished. Women screamed, children moaned, men cried. Here, children were anxiously calling their parents; and there, parents were seeking their children, or husbands their wives; all recognised each other only by their cries. The former lamented their own fate, and the latter that of those dearest to them. Many wished for death, from the fear of dying. Many called on the gods for assistance; others despaired of the existence of the gods, and thought this the last eternal night of the world. Actual dangers were magnified by unreal terrors. The earth continued to shake, and men, half-distracted, to reel about, exaggerating their own fears and those of others, by terrifying predictions."

Such is the frightful but true picture which Pliny gives us of the horrors of those who were,

however, far from the extremity of their misery. But what must have been the feelings of the Pompeians, when the roaring of the mountain, and the quaking of the earth, awaked them from their first sleep? They also attempted to escape the wrath of the gods; and, seizing the most valuable things they could lay their hands upon in the darkness and confusion, to seek their safety in flight. In this street, and in front of the house marked with the friendly salutation on its threshold, seven skeletons were found. The first carried a lamp, and the rest had still between the bones of their fingers something that they wished to save. On a sudden, they were overtaken by the storm which descended from heaven, and buried in the grave thus made for them. Before the above-mentioned country-house was still a male skeleton, standing with a dish in his hand; and, as he wore on his finger one of those rings which were allowed to be worn by Roman knights only, he is supposed to have been the master of the house, who had just opened the back-garden gate, with the intent of flying, when the shower overwhelmed him. Several skeletons were found in the very posture in which they had breathed their last, without having been forced by the agonies of death to drop the things they had in their hands. This leads to a conjecture, that the thick mass of ashes must have come down all at once, in such immense quantities as instantly to cover them. It cannot otherwise be imagined, how all the fugitives could all have been fixed, as it were by a charm, in their position; and in this manner their destiny was the less dreadful, seeing that death suddenly converted them into motionless statues, and thus was

stripped of all the horrors with which the fears of the sufferers had clothed him in imagination. But what then must have been the pitiable condition of those who had taken refuge in the buildings and cellars? Buried in the thickest darkness, they were secluded from every thing but lingering torment; and who can paint to himself, without shuddering, a slow dissolution approaching amid all the agonies of body and of mind? The soul recoils from the contemplation of such images.

To proceed now to the public edifices. The temple of Isis is still standing, with its Doric pillars, and its walls painted with emblems of the service of the Deity, such as the hippopotamus, cocoa-blossom, ibis, &c. The sacred vessels, lamps and tables of Isis, are still to be seen. From a little chapel withinside, a poisonous vapour is said to have formerly arisen, which the heathen priests may have used for every species of deception. This vapour is said to have increased after the violent eruption of Vesuvius; but has not latterly given out the slightest smell.

A small Grecian temple, of which only two pillars remain, had been probably already destroyed by an earthquake, which, in the reign of Titus, preceded the dreadful erruption of the volcano. On the opposite side of this temple, there is still an edifice, named the quarter of the soldiers, because all sorts of arms, pictures of soldiers, and a skeleton in chains, were found there. By others, it has been considered the Forum of Pompeii.

Two theatres, the smaller one particularly, are in an excellent state of preservation. The structure of this one is such as was usually adopted by the ancients, and is well deserving of modern imi-

tation, as it affords the spectators commodious seats, a free view of the stage, and facility of hearing. Although sufficiently large to contain two thousand persons, the plebeians, standing in a broad gallery at the top, were quite as able to see all that was passing on the stage, as the magistrate in his marble balcony. In this gallery, the arrangements for spreading the sailcloth over the spectators are still visible. The stage itself is very broad, as it has no side walls, and appears less deep than it really is. A wall runs across it, and cuts off just as much room as is necessary for the accommodation of the performers. But this wall has three very broad doors; the middle one is distinguished by its height, and the space behind it is still deeper than in front. If these doors, as may be conjectured, always stood open, the stage was in fact large, and afforded, besides, the advantage of being able to display a double scenery; if, for example, the scene in front was that of a street, there might have been behind a free prospect into the open field.

The cemetery lies before the gate of the high road. The tomb of the priestess Mammea, is very remarkable; it was erected, according to the epitaph, by virtue of a decree of the Decemvirs. In the midst of little boxes of stone, in square piles, and on a sort of altar, the family urns were placed in niches; and withoutside these piles, the broken piles are still to be seen. In front of the cemetery, by the road-side, is a beautiful seat, forming a semicircle which will contain twenty or thirty persons. It was probably overshadowed by trees eighteen hundred years ago; under which the women of Pompeii sat in the cool evenings, while

their children played before them, and viewed the crowds which were passing through the gate.—*Kotzebue's Travels.*

THE town of Pompeii now stands revealed to view, no longer roofed with cinders, and covered with vineyards, or imperfectly excavated and dimly seen; but lighted with the same bright sun that shone on it a moment before that convulsive heave which buried millions, and poured destruction in showers of fire. Among all the great monuments of antiquity, there is nothing comparable to this preserved specimen of the domestic architecture, domestic accommodation, and civil existence of the ancients. The city of Pompeii, after an inhumation of nearly eighteen hundred years, is now cleared and laid open; and it is entered like any other Italian town. The streets of Pompeii are narrow lanes, so narrow, that no modern carriage could pass through them, though they exhibit the marks of wheels. They are lined with the façades of small plain buildings. The street entrance passed, a little court presents itself, surrounded by a low range of building, divided into small separate apartments, generally not so large as the cells of a convent. The walls of these little cabinets are frequently painted in frescoes; the birds, beasts, and flowers, sometimes well executed; the pavement, in the better and larger houses, is of many coloured mosaics; but, excepting in one superior mansion, called the house of Sallust, we did not observe one room long enough to contain an English bed. In the centre of the court, almost universally stood a marble fountain or cistern of water.

Many of the houses had shops turned to the streets, the signs carved in stone over the door. In a dairy shop, the counter and places for the pans remained. An apothecary's shop was once designated by its contents, now removed to the museum; and a place of public refreshment was shown us, which one of the guides called a *Café*. The inference to be drawn from the smallness and incommodiousness of the private houses is, that the ancients, like the modern population of Rome and Naples, lived more abroad than in the house; and that the Forum, and the Temple, and the Circus, left them independent of home.—*Lady Morgan's Italy.*

THE LABYRINTH OF CRETE.

THE 1st of July, after we had furnished ourselves with flambeaux at the Arch-Priest's, we set forward to see the Labyrinth. This famous place is a subterranean passage, in manner of a street, which, by a thousand intricacies and windings, as it were by mere chance, and without the least regularity, pervades the whole cavity or inside of a little hill, at the foot of Mount Ida, southward, three miles from Gortyna.

The entrance into this Labyrinth is by a natural opening, seven or eight paces broad, but so low, that even a middle-sized man cannot pass through without stooping. The flooring of this entrance is very rugged and unequal; the ceiling flat and even, terminated by diverse beds of stone laid horizontally one upon another. The first thing you come

at is a kind of cavern, exceeding rustic, and gently sloping. In this there is nothing extraordinary but as you move forward, the place is perfectly surprising—nothing but turnings and crooked by ways. The principal alley, which is less perplexing than the rest, in length about 1200 paces leads to the further end of the Labyrinth, and concludes in two large beautiful apartments, where strangers rest themselves with pleasure. Though this alley divides itself, at its extremity, into two or three branches, yet the dangerous part of the Labyrinth is not there, but rather at its entrance about some thirty paces from the cavern on the left hand. If a man strikes into any other path after he has gone a good way, he is bewildered among a thousand twistings, turnings, sinuosities crinkle-crankles, and turn-again lanes, that he could scarce ever get out again without the utmost danger of being lost. Our guides, therefore, chose this principal alley, without deviating either to the right or left. In traversing this alley, we measured 1160 good paces. It is from seven to eight feet high, ceiled with a stratum of rocks, horizontal and quite flat, as are most beds of stone in those parts. And yet there are some places where a man must stoop a little; nay, about the middle of the route, you meet with a passage so very strait and low, that you must creep upon all four to get along. Generally speaking, the grand walking-place is broad enough for three or four to go abreast. Its pavement is smooth, not many ups nor downs. The walls are either cut perpendicular, or made of stones which formerly choked up the passage, and which are disposed with a studied regularity. But

so many alleys offer themselves on all sides, that you must take the utmost care how you proceed.

Being beforehand resolved to make the best of our way out of this subterranean maze, our first care was to post one of our guards at the mouth of the cavern, with orders to fetch people from the next town to come and help us out, in case we returned not before night. In the second place, each of us carried a large lighted flambeau in his hand; thirdly, at every difficult turning we fastened on the right hand scrolls of paper, numbered; fourthly, one of our guides dropt, on the left, small bundles of thorns, and another scattered straw all the way on the ground. In this manner we got safe enough to the further end of the Labyrinth, where the grand walk divides itself into two or three branches, and where there are likewise two rooms or apartments, almost round, about four toises in breadth, cut in the rock. Here are diverse inscriptions made with charcoal; such as,—"*Father Francisco Maria Pesaro, Capuchin.*"—"*Frater Tadeus Nicolaus*;" and over against it "1539;" further on, "1444." As likewise, "*Qui fu el strenuo Signor Zan de Comò Capno. de la Fanteria*, 1526." In English, "*Here was the Valiant Signor John de Como, Captain of Foot*, 1526." Among these writings there are some really wonderful. This corroborates the system proposed by me some years ago, concerning the vegetation of stones, which, in this Labyrinth, increase and grow sensibly, without being suspected to receive the least adventitious matter from without. When the persons were graving their names on the walls of this place, which are of

living rock, little did they imagine that the furrowings wrought by their penknives would be insensibly filled up, and in time adorned with a sort of embroidery, about a line high in some places, and near three lines in others; so that these characters, instead of being hollow and concave, as they were at first, are now turned convex, and come out of the rock like basso relievo. The matter of them is white, though the stone they issue from is greyish. I look upon this basso relievo to be a kind of callosity formed by the nutritious juice of the stone, extravasated by little and little into the above mentioned channellings made by the graver, like as callosities are formed at the extremities of the fibres of broken bones.

Having taken these precautions, it was easy enough to find our way out. But after a thorough examination of the structure of this Labyrinth, we all concurred in opinion, that it could never have been what Bellonias, and some others of the moderns, have fancied, namely, an ancient quarry, out of which were dug the stones that built the towns of Gortyna and Gnossus. Is it likely they would go for stone above a thousand paces deep, into a place so full of odd turnings, that it is next to impossible to disentangle one's self? Again, how could they draw these stones through a place so pinched in, that we were forced to crawl our way out for above a hundred paces together? Besides, the mountain is so craggy, and full of precipices, that we had all the difficulty in the world to ride up it.

It is, therefore, much more probable, that the Labyrinth is a natural cavity, which, in times past,

somebody, out of curiosity, took a fancy to try what they could make of, by widening most of those passages that were too much straitened. To raise the ceiling of it, they only took down some beds of stone, which quite throughout the mountain are horizontally posited; in some places they cut the walls plumb down, and in clearing the passages, they took care to place the stones very orderly. The reason why they meddled not with the narrow neck, mentioned before, was perhaps to let posterity know how the rest were naturally made; for beyond that place, the alley is as beautiful as on this side it. It would be a difficult task to rid away the stones beyond; unless they were broken to powder, they could never be brought through this gut-like passage. The ancient Cretans, who were a very polite people, strongly devoted to the fine arts, took a particular pleasure in finishing what had been but sketched out by nature. Doubtless, some shepherds having discovered these subterranean conduits, gave occasion to more considerable people to turn it into this marvellous image, to serve for an asylum in the civil wars, or to screen themselves from the fury of a tyrannical government. At present it is only a retreat for bats and the like. This place is extremely dry, not the least waterfall, congelation, nor drain, to be seen. We were told, that in the hills nigh the Labyrinth, there were two or three other natural openings of a vast depth, in the rock, which they may try the same experiments upon, if they have a mind. Through the whole island there are a world of caverns, and most of quick rock; especially in Mount Ida, there are holes you

may run your head in, bored through and through; many very deep and perpendicular abysses are seen there. May there not be also many horizontal conduits? especially in such places, where the lays of stone are horizontal upon one another.—*M. Tournefort's Voyage into the Levant.*

THE GARDEN OF THE HESPERIDES.

BENGAZI may be considered as occupying the site of the Berenice of the Ptolemies, and of the Hesperis of earlier times. Very few remains now appear above ground; but extensive remains of building are still found about Bengazi, at the depth of a foot or two from the surface of the plain; and whenever a house is intended to be erected, the projector of it has nothing more to do, in order to obtain materials for building it, than to send a few men to excavate in the neighbourhood, and with them a camel, or two or three asses, to transport what is dug up to the spot which has been fixed upon for the house.

Besides deep quarries, whence the cities of old were constructed, some very singular pits or chasms of natural formation are found in the neighbourhood of Bengazi. They consist of a level surface of excellent soil, of several hundred feet in extent, enclosed within steep, and, for the most part, perpendicular sides of solid rock, rising sometimes to a height of sixty or seventy feet, or more, before they reach the level of the plain in which they are situated. The soil at the

bottom of these chasms appears to have been washed down from the plain above by the heavy winter rains, and is frequently cultivated by the Arabs; so that a person, in walking over the country where they exist, comes suddenly upon a beautiful orchard or garden, blooming in secret, and in the greatest luxuriance, at a considerable depth beneath his feet, and defended on all sides by walls of solid rocks, so as to be at first sight apparently inaccessible. The effect of these little secluded spots, protected as it were from the intrusion of mankind by the steepness and the depth of the barriers which enclose them, is singular and pleasing in the extreme. They reminded us of some of those secluded retreats which we read of in fairy legends and tales; and we could almost fancy ourselves, as we looked down upon them, in the situation of some of those favoured knights and princes, the heroes of our earlier days, who have been permitted to wander over the boundaries of reality, into regions shut out from the rest of mankind. It was impossible to walk round the edge of these precipices, looking every where for some part less abrupt than the rest, by which we might descend into the gardens beneath, without calling to mind the description given by Scylax of the far-famed garden of the Hesperides. This celebrated retreat is stated by Scylax to have been an enclosed spot of about one-fifth of a British mile across, each way, filled with thickly planted fruit-trees of various kinds, and inaccessible on all sides. It was situated (on the authority of the same writer) at 620 stadia (or fifty geographical miles) from the Port of Barce; and this distance agrees precisely with that of the places here alluded to,

from Ptolemeta, the port intended by Scylax, as will be seen by a reference to the chart. The testimony of Pliny is also very decided in fixing the site of the Hesperides in the neighbourhood of Berenice.

We have shown that the nature of the ground in the neighbourhood of Berenice (or Bengazi) is consistent with the account of Scylax; and that places like those which he has so minutely described are actually to be found in the territory where he has laid down the gardens. This singular formation, so far as we have seen, is also peculiar to the country in question; and we know of no other part of the coast of Northern Africa where the same peculiarities of soil are observable. We do not mean to point out any one of these subterranean gardens as that which is described in the passage above quoted from Scylax; for we know of no one which will correspond in point of extent to the garden which this author has mentioned. All those which we saw were considerably less than the fifth of a mile in diameter (the measurement given by Scylax); and the places of this nature which would best agree with the dimensions in question, are now filled with water, sufficiently fresh to be drinkable, and take the form of romantic little lakes. Scarcely any two of the gardens we met with were, however, of the same depth or extent; and we have no reason to conclude, that, because we saw none which were large enough to be fixed upon for the garden of the Hesperides, as it is described in the statement of Scylax, there is, therefore, no place of the dimensions required among those which escaped our notice—particularly as the singular formation we

allude to continues to the foot of the Cyrenaic chain, which is fourteen miles distant, in the nearest part from Bengazi. The remarkable peculiarities of this part of Northern Africa correspond (in our opinion) sufficiently well with the authorities already quoted, to authorize the conclusion we have drawn from an inspection of the place; and to induce us to place the gardens of the Hesperides in some one or more of the places described, rather than in any of the Oases of the desert, as suggested by Monsieur Gosselin and others. Besides these, there are also several subterranean caves in the neighbourhood of Bengazi. One of these, at the depth of about eighty feet from the surface of the plain, contains a large body of fresh water, which is said to run very near into the bowels of the earth, or rather of the rock which overshadows it. On descending into this cave, we found that it widened out into a spacious chamber, the sides of which had evidently been, in many places, shaped with the chisel, and rose perpendicularly to a considerable height. Our progress was soon stopped, as we were advancing into the cave, by the body of water we have mentioned; which, notwithstanding the lights we procured, was scarcely visible through the thick gloom which surrounded us. We found the water shallow at the edge, but it soon became gradually too deep to be practicable; we were also unable to discover any end to it, and a stone thrown as far as we could send it, fell into the water without striking. We had, however, seen enough to excite our curiosity very strongly, and we determined to return at some early opportunity, with a boat and a good

store of torches, intending to go as far along this subterranean stream as the height of the rock would allow us. On mentioning our visit and our intentions to Bey Halil, he informed us that he had himself paid a visit to the place, in company with a chaous of his suite; and that he had carried with him a small boat, in which he embarked with the chaous, and proceeded a considerable distance. They became, at length, afraid of not finding their way back, and put about to return as they came, having found (as he said) on sounding, that the depth of the water was in some parts as much as thirty feet. We are too well acquainted with the talent of amplification so generally possessed by Turks and Arabs of all classes, to rely implicitly upon the truth of every part of the above mentioned narrative related to us by the Bey of Bengazi. There is, however, no reason of which we are aware, connected with the nature of the place, which militates against its probability; and we submit it accordingly, as we received it, to our readers, in the absence of more decided information.—*Lieutenant Beechey's Travels in Cyrene.*

THE ISLAND OF JUAN FERNANDES.*

THE island of *Juan Fernandes* lies in the latitude

* It was upon this Island that Alexander Selkirk lived alone for several years, and to which De Foe is supposed to allude in his popular Novel of "Robinson Crusoe." The authentic and graphic description of it, which we have selected, cannot fail to be read with interest.

of 33° 40′ south, and is a hundred and ten leagues distant from the continent of Chili. It is said to have received its name from a Spaniard who formerly procured a grant of it, and resided there some time, with a view of settling on it, but afterwards abandoned it.

The northern part of this island is composed of high craggy hills, many of them inaccessible, though generally covered with trees. The soil of this part is loose and shallow, so that very large trees on the hills soon perish for want of root, and are then easily overturned; which occasioned the unfortunate death of one of our sailors, who being upon the hills in search of goats, caught hold of a tree upon a declivity, to assist him in his ascent, and this giving way, he immediately rolled down the hill; and though in his fall he fastened on another tree of considerable bulk, yet that too gave way, and he fell amongst the rocks, and was dashed to pieces. Mr Brett likewise met with an accident only by resting his back against a tree nearly as large about as himself, which stood on a slope; for the tree giving way, he fell to a considerable distance, though without receiving any injury. Our prisoners (whom, as will be related in the sequel, we afterwards brought in here) remarked, that the appearance of the hills in some part of the island resembled that of the mountains in Chili, where the gold is found; so that it is not impossible that mines might be discovered here. We observed in some places several hills, of a peculiar sort of red earth, exceeding vermilion in colour, which perhaps, on examination, might prove useful for many purposes. The southern, or rather the south-west part of the island, is

widely different from the rest, being dry, stony, and destitute of trees, and very flat and low, compared with the hills on the northern part. This part of the island is never frequented by ships, being surrounded by a steep shore, and having little or no fresh water; and besides, it is exposed to the southerly wind, which generally blows here the whole year round, and in the winter solstice very hard.

The trees of which the woods on the northern side of the island are composed, are most of them aromatics, and of many different sorts. There are none of them of a size to yield any considerable timber, except the myrtle-trees, which are the largest on the island, and supplied us with all the timber we made use of; but even these would not work to a greater length than forty feet. The top of the myrtle-tree is circular, and appears as uniform and regular as if it had been clipped by art; it bears on its bark an excrescence like moss, which in taste and smell resembles garlic, and was used by our people instead of it. We found here, too, the pimento-tree, and likewise the cabbage-tree, though in no great plenty. And besides a great number of plants of various kinds, which we were not botanists enough either to describe or attend to, we found here almost all the vegetables which are usually esteemed to be particularly adapted to the cure of those scorbutic disorders which are contracted by salt diet and long voyages. For here we had great quantities of water-cresses and purslain, with excellent wild sorrel, and a vast profusion of turnips and Sicilian radishes; these two last having some resemblance to each other, were confounded by our people un-

der the general name of turnips. We usually preferred the tops of the turnips to the roots, which were often stringy, though some of them were free from that exception, and remarkably good. These vegetables, with the fish and flesh we got here, and which I shall more particularly describe hereafter, were not only extremely grateful to our palates, after the long course of salt diet which we had been confined to, but were likewise of the most salutary consequence to our sick, in recovering and invigorating them, and of no mean service to us who were well, in destroying the lurking seeds of the scurvy, from which perhaps none of us were totally exempt, and in refreshing and restoring us to our wonted strength and activity.

To the vegetables I have already mentioned, of which we made perpetual use, I must add, that we found many acres of ground covered with oats and clover. There were also some few cabbage-trees upon the island, as was observed before; but as they generally grew on the precipices, and in dangerous situations, and as it was necessary to cut down a large tree for every single cabbage, this was a dainty that we were able but rarely to indulge in.

The excellence of the climate, and the looseness of the soil, render this place extremely proper for all kinds of vegetation; for if the ground be any where accidentally turned up, it is immediately overgrown with turnips and Sicilian radishes. Mr Anson, therefore, having with him garden seeds of all kinds, and stones of different sorts of fruits, he, for the better accommodation of his countrymen who should hereafter touch here, sowed both

lettuces, carrots, and other garden plants, and set in the woods a great variety of plum, apricot, and peach stones; and these last, he has been informed, have since thriven to a very remarkable degree; for some gentlemen who, in their passage from Lima to Old Spain, were taken and brought to England, having procured leave to wait upon Mr Anson, to thank him for his generosity and humanity to his prisoners, some of whom were their relations, they, in casual discourse with him about his transactions in the South Seas, particularly asked him, if he had not planted a great number of fruit-stones in the island of Juan Fernandes; for they told him, their late navigators had discovered there numbers of peach-trees and apricot-trees, which, being fruits before unobserved in that place, they concluded them to have been produced from kernels set by him.

This may in general suffice as to the soil and vegetable productions of this place; but the face of the country, at least of the north part of the island, is so extremely singular, that I cannot avoid giving it a particular consideration. I have already taken notice of the wild, inhospitable air with which it first appeared to us, and the gradual improvement of this uncouth landscape as we drew nearer, till we were at last captivated by the numerous beauties we discovered on the shore; and I must now add, that we found, during the time of our residence there, that the inland parts of the island did no ways fall short of the sanguine prepossessions which we first entertained in their favour. For the woods, which covered most of the steepest hills, were free from all bushes and underwood, and afforded an easy passage through every

part of them; and the irregularities of the hills and precipices, in the northern part of the island, necessarily traced out, by their various combinations, a great number of romantic valleys; most of which had a stream of the clearest water running through them, that tumbled in cascades from rock to rock, as the bottom of the valley, by the course of the neighbouring hills, was at any time broken into a sudden sharp descent. Some particular spots occurred in these valleys, where the shade and fragrance of the contiguous woods, the loftiness of the overhanging rocks, and the transparency and frequent falls of the neighbouring streams, presented scenes of such elegance and dignity, as would, with difficulty, be rivalled in any other part of the globe. It is in this place, perhaps, that the simple productions of unassisted nature, may be said to excel all the fictitious descriptions of the most animated imagination. I shall finish this article, with a short account of that spot where the commodore pitched his tent, and which he made choice of for his own residence, though I despair of conveying an adequate idea of its beauty. The piece of ground which he chose, was a small lawn, that lay on a little ascent, at the distance of about half a mile from the sea. In the front of his tent, there was a large avenue cut through the woods to the sea-side, which, sloping to the water with a gentle descent, opened a prospect of the bay, and the ships at anchor. This lawn was screened behind by a tall wood of myrtle, sweeping round it in the form of a theatre, the slope on which the wood stood, rising with a much sharper ascent than the lawn itself, though not so much, but that the hills and precipices within land,

towered up considerably above the tops of the trees, and added to the grandeur of the view. There were, besides, two streams of crystal water, which ran on the right and left of the tent, within an hundred yards distance, and were shaded by the trees which skirted the lawn on either side, and completed the symmetry of the whole.

It remains now only that we speak of the ani- animals and provisions which we met with at this place. Former writers have related, that this island abounded with vast numbers of goats, and their accounts are not to be questioned, this place being the usual haunt of the buccaneers and privateers who formerly frequented those seas. And there are two instances, one of a Musquito Indian, and the other of *Alexander Selkirk*, a Scotchman, who were left here by their respective ships, and lived alone upon this island for some years, and consequently were no strangers to its produce. Selkirk, who was the last, after a stay of between four and five years, was taken off the place by the *Duke* and *Duchess* privateers of Bristol, as may be seen at large in the Journal of their Voyage. His manner of life during his solitude was in most particulars very remarkable; but there is one circumstance he relates, which was so strangely verified by our own observation, that I cannot help reciting it. He tells us, amongst other things, that as he often caught more goats than he wanted, he sometimes marked their ears, and let them go. This was about thirty-two years before our arrival at the island. Now it happened, that the first goat that was killed by our people at their landing had his ears slit; whence we concluded, that he had doubtless been formerly under the power of Sel-

kirk. This was indeed an animal of a most venerable aspect, dignified with an exceeding majestic beard, and with many other symptoms of antiquity. During our stay on the island, we met with others marked in the same manner; all the males being distinguished by an exuberance of beard, and every other characteristic of extreme age.

But the great numbers of goats, which former writers describe to have been found upon this island, are at present very much diminished. As the Spaniards, being informed of the advantages which the buccaneers and privateers drew from the provisions which goat's flesh here furnished them with, have endeavoured to extirpate the breed, thereby to deprive their enemies of their relief. For this purpose, they have put on shore great numbers of large dogs, who have increased apace, and have destroyed all the goats in the accessible parts of the country; so that there now remain only a few amongst the crags and precipices, where the dogs cannot follow them. These are divided into separate herds of twenty or thirty each, which inhabit distinct fastnesses, and never mingle with each other. By this means we found it extremely difficult to kill them; and yet we were so desirous of their flesh, which we all agreed much resembled venison, that we got knowledge, I believe, of all their herds; and it was conceived, by comparing their numbers together, that they scarcely exceeded two hundred upon the whole island. I remember we had once an opportunity of observing a remarkable dispute betwixt a herd of these animals and a number of dogs; for, going in our boat into the eastern bay, we perceived some dogs run-

ning very eagerly upon the foot, and being willing to discover what game they were after, we lay upon our oars some time to view them, and at last saw them take to a hill, where, looking a little further, we observed upon the ridge of it an herd of goats, which seemed drawn up for their reception. There was a very narrow path skirted on each side by precipices, on which the master of the herd posted himself fronting the enemy, the rest of the goats being all behind him, where the ground was more open. As this spot was inaccessible by any other path, excepting where this champion had placed himself, the dogs, though they ran up hill with great alacrity, yet, when they came within about twenty yards of him, they found they durst not encounter him, (for he would infallibly have driven them down the precipice), but gave over the chase, and quietly laid themselves down, panting at a great rate. These dogs, who are masters of all the accessible parts of the island, are of various kinds, some of them very large, and are multiplied to a prodigious degree. They sometimes came down to our habitations at night, and stole our provision; and once or twice they set upon single persons; but assistance being at hand, they were driven off without doing any mischief. As at present it is rare for goats to fall in their way, we conceived that they lived principally upon young seals; and, indeed, some of our people had the curiosity to kill dogs sometimes, and dress them, and it seemed to be agreed that they had a fishy taste.

Goat's flesh, as I have mentioned, being scarce, we rarely being able to kill above one a day; and our people growing tired of fish, (which, as I shall

hereafter observe, abound at this place), they a last condescended to eat seals, which by degrees they came to relish, and called it lamb. The seal, numbers of which haunt this island, hath been so often mentioned by former writers, that it is unnecessary to say any thing particular about them in this place. But there is another amphibious creature to be met with here, called a sea-lion, that bears some resemblance to a seal, though it is much larger. This, too, we eat under the denomination of beef; and as it is so extraordinary an animal, I conceive it well merits a particular description. They are in size, when arrived at their full growth, from twelve to twenty feet in length, and from eight to fifteen in circumference. They are extremely fat, so that, after having cut through the skin, which is about an inch in thickness, there is at least a foot of fat before you can either come at lean or bones; and we experienced more than once that the fat of some of the largest afforded us a butt of oil. They are likewise very full of blood; for if they are deeply wounded in a dozen places, there will instantly gush out as many fountains of blood, spouting to a considerable distance; and to try what quantity of blood they contained, we shot one first, and then cut its throat; and measuring the blood that came from him, we found that, besides what remained in the vessels, which to be sure was considerable, we got at least two hogsheads. Their skins are covered with short hair, of a light dun colour, but their tails and their fins, which serve them for feet on shore, are almost black. Their fins or feet are divided at the ends like fingers, the web which joins them not reaching to the extremities, and each of these fingers is

furnished with a nail. They have a distant resemblance to an overgrown seal, though, in some particulars, there is a manifest difference between them, especially in the males. These have a large snout or trunk hanging down five or six inches below the end of the upper jaw, which the females have not; and this renders the countenance of the male and female easy to be distinguished from each other, and besides the males are of a much larger size. The form and appearance, both of the male and female, are very exactly represented in the nineteenth plate, only the disproportion of their size is not usually so great as is there exhibited; for the male was drawn from the life, after the largest of these animals which was found upon the island. He was the master of the flock, and, from his driving off the other males, and keeping a great number of females to himself, he was by the seamen ludicrously styled the Bashaw. These animals divide their time equally between the land and the sea, continuing on sea all the summer, and coming on shore at the setting in of winter, where they reside during that whole season. In this interval they engender, and bring forth their young, and have generally two at a birth; which they suckle with their milk, they being at first about the size of a full grown seal. During the time these sea-lions continue on shore, they feed on the grass and verdure which grows near the banks of the fresh-water streams; and, when not employed on feeding, sleep in herds in the most miry places they can find out. As they seem to be of a very lethargic disposition, and are not easily wakened, each herd was observed to place some of their males at a distance, in the nature of sentinels, who

never failed to alarm them, whenever any one attempted to molest or even to approach them; and they were very capable of alarming even at a considerable distance; for the noise they make is very loud, and of different kinds, sometimes grunting like hogs, and at other times snorting like horses in full vigour. They often, especially the males, have furious battles with each other, principally about their females; and we were one day extremely surprised by the sight of two animals, which at first appeared different from all that we had ever observed; but, on a nearer approach, they proved to be two sea-lions, who had been goring each other with their teeth, and were covered over with blood; and the bashaw before mentioned, who generally lay surrounded by a seraglio of females, which no other male dared to approach, had not acquired that envied pre-eminence without many bloody contests, of which the marks still remained in the numerous scars which were visible on every part of his body. We killed many of them for food, particularly for their hearts and tongues, which we esteemed exceeding good eating, and preferable even to those of bullocks. In general, there was no difficulty in killing them; for they were incapable either of resisting or escaping, as their motion is the most unwieldy that can be conceived, their blubber, all the time they are moving, being agitated in large waves under their skins. However, a sailor being one day carelessly employed in skinning a young sea-lion, the female, from whence he had taken it, came upon him unperceived, and getting his head in her mouth, she, with her teeth, scored his skull in notches in many places, and thereby wounded

him so desperately, that, though all possible care was taken of him, he died in a few days.

These are the principal animals which we found upon the island; for we saw but few birds, and those chiefly hawks, blackbirds, owls, and humming-birds. We saw not the pardela, which burrows in the ground, and which former writers have mentioned to be found here; but as we often met with their holes, we supposed that the dogs had destroyed them, as they have almost done the cats; for these were very numerous in Selkirk's time; but we saw not above one or two during our whole stay. However, the rats still keep their ground, and continue here in great numbers, and were very troublesome to us, by infesting our tents nightly.

But that which furnished us with the most delicious repasts at this island, remains still to be described. This was the fish, with which the whole bay was most plentifully stored, and with the greatest variety; for we found here cod of a prodigious size; and by the report of some of our crew, who had been formerly employed in the Newfoundland fishery, not in less plenty than is to be met with on the banks of that island. We caught also cavallies, gropers, large breams, maids, silver fish, congers of a peculiar kind, and, above all, a black fish which we much esteemed, called by some a chimney-sweeper, in shape resembling a carp. The beach, indeed, is everywhere so full of rocks and loose stones, that there is no possibility of haling the seine; but with hooks and lines we caught what numbers we pleased; so that a boat with two or three lines would return loaded with fish in about two or three hours time. The only interruption we ever met with, arose from great

quantities of dog-fish, and large sharks, which sometimes attended our boats, and prevented our sport. Besides the fish we have already mentioned, we found here one delicacy in greater perfection, both as to size, flavour, and quantity, than is perhaps to be met with in any other part of the world. This was sea cray-fish. They generally weighed eight or nine pounds apiece, were of a most excellent taste, and lay in such abundance near the water's edge, that the boat-hooks often struck into them in putting the boat to and from the shore.

These are the most material articles relating to the accommodations, soil, vegetables, animals, and other productions of the Island of Juan Fernandes; by which it must appear, how properly the place was adapted for recovering us from the deplorable situation to which our tedious and unfortunate navigation round Cape Horn had reduced us.—*Anson's Voyage round the World.*

SALT LAKE OF LOONAR, AT BERAR, EAST INDIES.*

It was towards the close of a cool and delightful evening in August 1823, that I was riding leisurely along in a wooded district in Berar, and at about forty miles from the encampment of Jaulrah, in company with a small party of Mogullee horse, in the pay of his Highness the Nizam, which I had overtaken during my journeying. Whilst engaged in commonplace conversation with their leader, a Duffadar, who was armed cap-a-pee, with quilted

* See the Vignette to this Volume.

jacket, Damascus blade, spear, shield, and what not,—our discourse was interrupted, upon emerging from the shaded and gently ascending path along which our road lay, by our approach to a low and lengthened mound, the summit of which having been attained, a most romantic and interesting spectacle was presented to us.

Beneath our feet, and at the bottom of a mighty chasm, lay a deep still lake, the waters of which were slightly ruffled by the breeze, and beautifully tinted by the rays of the setting sun. It was of a circular form, and hemmed in by an amphitheatre of cliffs, which rose, in precipitous ridges, to an elevation of about 500 feet from its shores, environing it on every side, and preventing completely the egress of its waters. The rocks which surround this interesting piece of water, cannot come under the denomination of hills, for they do not, in any part, tour above the level of the surrounding country; they merely form the sides of an immense caldron, the circumference of which is about three miles. In short, the scenery, taken collectively, is a small counterpart of the celebrated Lake Avernus, differing from it in this respect, that no river

"Laco se condidit alto."

In lieu of which, a solitary spring of some magnitude dashes in a small cascade from the eastern face of the rocks, and pours its waters into an artificial stone tank, surrounded by temples and pagodas, dedicated to the god Siva; issuing from which it forms another cataract, of about 50 feet in height, before it rushes on its turbid course to join the waters of the lake.

The whole landscape, though confined, is extremely pleasing. The dark green surface of these

sunken waters strongly reflects the graceful forms of the princely palms (*Borassus flabelliformis*, or fan-leaved), which fringe the margin, and advance into the waters of the lake their lofty stems. The sloping enclosure of rocks is covered half way up with mango and tamarind trees, interspersed with the *Rhododendron maximum*, or laurel-leaved Rhododendrum, which here attains a height of ten feet. A little picturesque temple, on the opposite side of the lake from the fountain, advances its white walls to the brink. It is seldom or never visited by the inhabitants of the adjoining village, from the dread of tigers, which inhabit the jungle around it, which also forms a shelter for numerous herds of Sambers or Neel-gaes (a species of Cervus, and known in menageries by the appellation of the Horned Horse). The audacity of our small party in tasting of the waters of the lake, was looked upon by the villagers as the grossest presumption and fool-hardiness.

Superstition, always delighting in dark ideas, early and eargerly seized upon this spot, and hither she led her votaries to celebrate her dismal orgies. The weather-worn appearance of the buildings around the spring, sufficiently indicates that it has long been a seat of Hindoo worship. At this time, however, the small stone tank exhibited a lively and interesting sight. Crowds of Mahratah women, in a state of semi-nudity, laved their limbs in its refreshing waters; others were employed in washing their clothes, lightening their labour with singing; whilst a solitary and aged Brahmin poured his evening libation on the uncouth statue of the god.—*Edinburgh Philosophical Journal.*

DIAMONDS, AND OTHER PRECIOUS STONES.

In the history of the human race, there are few things which at first sight appear so remarkable as the prodigious value which, by common consent in all ages and in all civilized countries, has been attached to the diamond. That a house, with a large estate, the means of living not only at ease but in splendour, should be set in competition with, and even be deemed inadequate to the purchase of a transparent crystallized stone, not half the size of a hen's egg, seems almost a kind of insanity. It would, indeed, truly deserve this name if the purchaser were to part with what the seller would acquire by such a transfer. If, for the consciousness of possessing a diamond of nearly three quarters of an ounce weight, a country gentleman were to pay ninety thousand pounds in ready money, and an annuity of 4000*l.* besides, he would, very deservedly, incur some risk of a statute of lunacy; yet, not only the above sum was given, but a patent of nobility into the bargain, by the Empress Catherine of Russia, for the famous diamond of Nadir Shah. In this case however, although the seller acquired much, the purchaser did not undergo any personal privation; and, in reality, notwithstanding the costliness and high estimation of diamonds, they are not put in competition with the substantial comforts and conveniences of life. Among ornaments, and luxuries, they however unquestionably occupy, and have ever occupied, the highest rank. Even fa-

shion, proverbially capricious as she is, has remained steady in this, one of her earliest attachments, during probably three or four thousand years. There must be, therefore, in the nature of things, some adequate reason for this universal consent, which becomes a curious object of inquiry.

The utility of the diamond, great as it is in some respects, enters for little or nothing into the calculation of its price; at least, all that portion of its value which constitutes the difference between the cost of an entire diamond and an equal weight of diamond powder, must be attributed to other causes.

The beauty of this gem, depending on its unrivalled lustre, is, no doubt, the circumstance which originally brought it into notice, and still continues to uphold it in the public estimation; and, certainly, notwithstanding the smallness of its bulk, there is not any substance, natural or artificial, which can sustain any comparison with it in this respect. The vivid and various refractions of the opal, the refreshing tints of the emerald, the singular and beautiful light which streams from the six-rayed star of the girasol, the various colours, combined with high lustre, which distinguish the ruby, the sapphire, and the topaz, beautiful as they are on a near inspection, are almost entirely lost to a distant beholder; whereas the diamond, without any essential colour of its own, imbibes the pure solar ray, and then reflects it, either with undiminished intensity, too white and too vivid to be sustained for more than an instant by the most insensible eye, or decomposed by refraction into those prismatic colours which paint the rainbow, and the morning and evening clouds,

combined with a brilliancy which yields, and hardly yields, to that of the meridian sun. Other gems, inserted into rings and bracelets, are best seen by the wearer, and, if they attract the notice of the bystanders, divide their attention, and withdraw those regards which ought to be concentered on the person, to the merely accessary ornaments. The diamond, on the contrary, whether blazing on the crown of state, or diffusing its starry radiance from the breast of titled merit, " or in courts and feasts, and high solemnities," wreathing itself with the hair, illustrating the shape and colour of the neck, and entering ambitiously into contest with the lively lustre of those eyes that rain influence on all beholders, blends harmoniously with the general effect, and proclaims to the most distant ring of the surrounding crowd, the person of the monarch, of the knight, or of the beauty.

Another circumstance tending to enhance the value of the diamond is, that although small stones are sufficiently abundant to be within the reach of moderate expenditure, and, therefore, afford to all those who are in easy circumstances an opportunity to acquire a taste for diamonds, yet those of a larger size are and ever have been rather rare; and of those which are celebrated for their size and beauty, the whole number, at least in Europe, scarcely amounts to half a dozen, all of them being in the possession of sovereign princes. Hence, the acquisition even of a moderately large diamond, is what mere money cannot always command; and many are the favours, both political and of other kinds, for which a diamond of a large size, or of uncommon beauty, may be offered as a compensation, where its commercial price in money neither

can be tendered, nor would be received. In many circumstances, also, it is a matter of no small importance for a person to have a considerable part of his property in the most portable form possible; and in this respect what is there that can be compared to diamonds, which possess the portability, without the risk, of bills of exchange? It may further be remarked, in favour of this species of property, that it is but little liable to fluctuation, and has gone on pretty regularly increasing in value, insomuch that the price of stones of good quality is considerably higher than it was some years ago.

The art of cutting and polishing diamonds has a twofold object; first, to divide the natural surface of the stone in a symmetrical manner, by means of highly polished polygonal planes, and thus to bring out, to the best advantage, the wonderful refulgence of this beautiful gem; and, secondly, by cutting out such flaws as may happen to be near the surface, to remove those blemishes which materially detract from its beauty, and consequently from its value.

The removal of flaws is a matter of great importance, for, owing to the form in which the diamond is cut, and its high degree of refrangibility, the smallest fault is magnified, and becomes obtrusively visible on every face. For this reason, also, it is by no means an easy matter at all times to ascertain whether a flaw is or is not superficial; and a person, with a correct and well practised eye, may often purchase to great advantage stones which appear to be flawed quite through, but are, in fact, only superficially blemished.

The most esteemed, and at the same time rarest colour of the oriental ruby, is pure carmine, or blood-red of considerable intensity, forming, when well polished, a blaze of the most exquisite and unrivalled tint. It is, however, more or less pale, and mixed with blue in various proportions; hence it occurs rose-red and reddish white, crimson, peach-blossom red, and lilac-blue, the latter variety being named oriental amethyst. It is a native of Pegue, and is said to be found in the sand of certain streams near the town of Serian, the capital of that country; it also occurs with sapphire, in the sands of the rivers of Ceylon. A ruby, perfect both in colour and transparency, is much less common than a good diamond, and when of the weight of three or four carats, is even more valuable than that gem. The king of Pegue, and the monarchs of Ava and Siam, monopolize the finest rubies, in the same way as the sovereigns of India make a monopoly of diamonds. The finest ruby in the world is in possession of the first of these kings; its purity has passed into a proverb, and its worth, when compared with gold, is inestimable. The Subah of the Decan, also, is in possession of a prodigiously fine one, a full inch in diameter. The princes of Europe cannot boast of any of a first-rate magnitude.

The oriental sapphire ranks next in value to the ruby; when perfect, its colour is a clear and bright Prussian blue, united to a high degree of transparency. The asterias or star-stone, is a remarkable variety of this beautiful gem; it is semi-transparent, with a reddish purple tinge.—*Mawe on Precious Stones.*

PART FIRST—TERRESTRIAL.

II. ANIMATE.

CURIOUS DIVERSITIES IN THE CONSTITUTION OF SOME MEN.

THAT the original of man's body is nothing else besides the dust of the ground, is a certain and unquestionable truth. Yet, as out of that dust there springs such variety of trees, plants and flowers, with different forms, colours and virtues, as may reasonably solicit a considering mind to a just veneration of the wisdom and bounty of the Creator; so, though all human bodies are framed of the same coarse materials, yet some of them are endowed with such peculiar properties and qualities, so removed from the constitution of others, that man need travel no further than himself for a sufficient theme, wherein he may at once enlarge his thoughts to the praises of his Maker, and admiration of his own wonderful composure. Every man is a moving miracle; but there are some that may justly move the wonder of all the rest. For,

1. Avicenna writes of one, that, when he pleased,

could put himself into a palsy; nor was he hur by any venomous creature, but when he forced o provoked them to it; of which, notwithstanding themselves would die, so poisonous was his body —*Cal. Rod. Ant. Sect. l.* 20. *c.* 16.—*Schench Obs. Med. l.* 1. *Obs.* 3. *p.* 85.

2. That is a wonderful story which is relate by Jovianus Pontanus, concerning one Colan o Catana in Sicily, surnamed the Fish, who live longer in the water than on the land. He wa constrained every day to abide in the water: an he said that if he was long absent thence, he coul scarce breathe or live, and that it would be hi death to forbear it. He was so excellent in swim ming, that, as a sea-fish, he would cut the seas i the greatest seas and tempests; and, in despite o the resisting waves, swim more than 500 furlong at once. At last in the Sicilian sea, at the have of Messina, diving for a piece of plate which th king had caused to be cast in as a prize to hin that could fetch it from the bottom, he there los his life; for he was never seen after, being eithe devoured by a fish, or engaged in some of th cavities of the rock.—*Alex. ab Alexand. Gen Diex. l.* 2. *c.* 21. *p.* 91. *Sandys on Ovid. Me l.* 13. *p.* 252.

3. It is related of Lord Bacon, that he had on peculiar temper of body, which was, that he faint ed always at an eclipse of the moon, though h knew not of it, and considered it not.—*Lloyd' State Worthies*, p. 837.

4. Rodericus Fonseca, a physician of great re putation in Pisa, bought for his household employ ment a negro slave, who, as often as she pleased, took burning coals into her hands or mouth, with-

out any hurt at all. This was confirmed to me by Gabriel Fonseca, an excellent physician in Rome, and by another of deserved credit, who told me he had frequently seen the trial, and red hot coals held in her hand till they were almost cold, and this without any impression of fire left upon her; and I myself saw the same thing done by a female negro, in the Hospital of the Holy Ghost, to which I was physician.—*Petr. Serv. in Dissert. de Ung. Armar.* p. 29, 30.

5. It is familiarly known all over Pisa, of Martinus Ceccho, a townsman of Montelupo, that he used to take hot coals in his hand, put them in his mouth, and bite them in pieces with his teeth, till he had extinguished them. He would tread upon them with his bare feet. He would put boiling lead into his mouth, and suffer a burning candle to be held under his tongue, as he put it out of his mouth; and many such other things as may seem incredible. All this was confirmed to me by divers Capuchins, and my worthy friend Nicolaus Accursius, of the order of St Francis.—*Petr. Serv. in Dissert. de Ung. Armar.* p. 33, 34.

6. Colonel Townshend, a gentleman of honour and integrity, had for many years been afflicted with a nephritic complaint. His illness increasing and his strength decaying, he came from Bristol to Bath in a litter, in autumn, and lay at the Bell-Inn. Dr Baynard and I (Dr Cheyne) were called to him, and attended him twice a day; but his vomitings continuing still incessant, and obstinate against all remedies, we despaired of his recovery. While he was in this condition he sent for us one morning; we waited on him, with Mr Skrine, his apothecary. We found his senses clear, and his

mind calm; his nurse and several servants were about him. He told us, he had sent for us, to give him some account of an odd sensation he had for some time observed and felt in himself; which was, that, composing himself, he could die or expire when he pleased, and yet by an effort, or somehow, he could come to life again, which he had sometimes tried before he sent for us. We heard this with surprise; but as it was not to be accounted for from common principles, we could hardly believe the fact as he related it, much less give any account of it; unless he should please to make the experiment before us, which we were unwilling he should do, lest, in his weak condition, he might carry it too far. He continued to talk very distinctly and sensibly, above a quarter of an hour, about this surprising sensation, and insisted so much on our seeing the trial made, that we were at last forced to comply. We all three felt his pulse first; it was distinct, though small and thready; and his heart had its usual beating. He composed himself on his back, and lay in a still posture some time; while I held his right hand, Dr Baynard laid his hand on his heart, and Mr Skrine held a clean looking-glass to his mouth. I found his pulse sink gradually, till at last I could not feel any, by the most exact and nice touch. Dr Baynard could not feel the least motion in his heart, nor Mr Skrine the least soil of breath on the bright mirror he held to his mouth; then each of us, by turns, examined his arm, heart, and breath, but could not by the nicest scrutiny, discover the least symptom of life in him. We reasoned a long time about this odd appearance as well as we could, and all of us

judging it inexplicable and unaccountable, and finding he still continued in that condition, we began to conclude that he had indeed carried the experiment too far, and at last were satisfied he was actually dead, and were just ready to leave him. This continued about half an hour. As we were going away, we observed some motion about the body, and, upon examination, found his pulse, and the motion of his heart gradually returning; he began to breath gently and speak softly; we were all astonished to the last degree, at this unexpected change; and after some further conversation with him, and among ourselves, went away fully satisfied as to all the particulars of this fact, but confounded and puzzled, and not able to form any rational scheme that might account for it.—*Cheyne's Eng. Mal.*

7. A man living not long since in Bristol, always ate his food twice, and truly ruminated as cows, sheep, and other beasts do, and always did so ever since he could remember. He began to chew his meat a second time within a quarter of an hour after his meal, if he drank with it, if not, something longer; after a full meal his chewing lasted about an hour and a half. If he went to bed presently after meals, he could not sleep till the usual time of chewing was over. If it left him, it was a certain sign he would be sick, and was never well till it returned again. Before rumination, he said, his victuals laid heavy in the lower part of his throat, till it had passed the second chewing, and then passed clean away. And this he always observed, that if he eat of various things, that which passed first down came up first to be chewed. This account came to Dr Sloan, from

Mr Day, at that time Mayor of Br' 'ol, who said this person was about twenty years of age, and of tolerable sense and reason.—*Philosph. Trans. No.* 109–1692.

8. Mr St George Ash, Secretary of the Dublin Society, in a letter to one of the Secretaries of the Royal Society, relates the story of a girl named Ann Jackson, born of English parents in the city of Waterford in Ireland, from whose body, when about three years old, horns grew out in several places, wherefore the mother concealed her out of shame, and bred her up privately; but she soon after dying, and the father being poor, the child was thrown upon the parish. She is now, says he between thirteen and fourteen years of age, yet can scarce go, and I have seen children of five years old taller; she is very silly, speaks but little and that not plainly; her voice is low and rough; her complexion and face well enough, except her eyes, which are very dead, and she can hardly perceive the difference of colours. The horns are bound chiefly about the joints and flexures, and are fastened to the skin like warts; and about the roots resemble them much in substance, though toward the extremities, they grow much harder and more horny. At the end of each finger and toe grows a horn as long as the finger and toe, not straight, but bending like a turkey's claw. On the other joints of her fingers and toes are smaller horns, which sometimes fall off, and others grow in their places. On her knees and elbows, and round about the joints are many horns; two more remarkable at the point of each elbow, which twist like rams horns; that on the left arm is above an inch broad, and four inches long. On her but-

tocks grow a great number, which are flat by frequent sitting. At her armpits and the nipples of her breasts, small hard substances shoot out, much slenderer and whiter than the rest. At each ear also grows a horn; and the skin of her neck begins of late to be callous and horny, like that of her hands and feet. She eats and drinks heartily, sleeps soundly, and performs all the offices of nature like other healthy people.—*Ibid.* 1685.—*Wanley's "Wonders of the Little World."*

REMARKABLE INSTANCES OF BODILY STRENGTH.

THE northern nations have made frequent invasion and irruptions into the southern parts; wherein, as an irresistible torrent, they have borne all away before them; yet it is observed, they never established any durable empire there; the reason is said to be, because the southern wisdom in the upshot hath always proved an overmatch for the northern strength. What might we not expect from an able body in conjunction with a fertile brain, when we see such wonders performed by each of them single? Admirable are the instances of bodily strength from the relations of most credible authors.

1. Many yet alive know how strong and mighty George of Froasberg, Baron of Mindlehaim was. He was able, with the middle finger of his right hand, to remove a very strong man out of his place, though he sat ever so firm. He stopped a horse

suddenly, that ran in a full career, by only touching the bridle; and with his shoulder would easily shove a cannon whither he pleased. His joints seemed to be made of horn; and he wrested twisted ropes and horse-shoes asunder with his hands.—*Jovii. Elog. lib.* 6. *p.* 285.—*Reusner de Scorbut. Exercit.* 1. *p.* 29.—*Camerar. Cent.* 1. *Cap.* 82. *p.* 380.

2. Cardan writes, that himself saw a man dancing with two men in his arms, two upon his shoulders, and one hanging about his neck.—*Fuller's Worth. p.* 215.

3. Julius Capitolinus and others report of the tyrant Maximinus, (who murdered and succeeded the good Alexander Severus), that he was so strong, that with his hands he drew carts and waggons full laden. With a blow of his fist he struck out a horse's tooth, and with a kick broke his thighs. He crumbled stones betwixt his fingers; he cleft young trees with his hands; so that he was surnamed Hercules, Anteus, and Milo.—*Camerar. Hor. Subcis. cent.* 1. *cap.* 82. *p.* 377. *Capitol.*

4. Trebellius Pollio writes of Caius Marius, a cutler by his first occupation, (and who in the time of Galienus was chosen emperor by the soldiers), that there was not any man who had stronger hands to strike and thrust than he. The veins of his hands seemed as if they had been sinews; with his fourth finger he stayed a cart drawn with horses, and drew it backward. If he gave but a fillip to the strongest man that then was, he would feel it as if he had received a blow on his forehead with a hammer. With two fingers he would wrest and break many strong cords twisted together.—

Pollio Camerar. Hor. Subcis. cent. 1. *cap.* 82. *p.* 377.

5. The giant Ænother was born in Turgaw, a village of Suavia. He bore arms under Charlemagne. He felled men, as one would mow hay, and sometimes broached a great number of them upon his pike or spear, and so carried them all on his shoulder, as one would do little birds spitted upon a stick.—*Camerar. Hor. Subcis. Aventin. Hist. Boiir. lib.* 4.

6. Thomas Farel reports of Galeot Bardasin, a gentleman of Catana, that he grew from time to time to even a height and bigness of body, that he exceeded all other men, how great soever, from the shoulder upwards. He was too hard for all others in leaping, throwing a stone, and tossing the pike; for he was strong and mighty according to his stature. Being armed at all points, his casque on his head, a javelin in his right hand, and holding the pommel of his saddle in his left, he would spring into the seat without help of stirrup, or other advantages. Sometimes he would bestride a great courser unbridled, and having brought him to his full speed, would stop him suddenly in his course, by straining him only with his thighs and legs. With his hands, he would take up from the ground an ass with his load, which commonly weighed three kintals. He struggled, in the way of pastime, with two of the strongest men that could be found, of which he held one fast with one arm, and threw the other to the ground, and keeping him under his knee; at last, he pulled down the second, and bound their hands behind their backs.—*Camerar. Hor. Sub-*

cis. cent. 1. *c.* 82. *p.* 379.—*Reusner de Scorbut. Exerc.* 1. *p.* 28.

7. Tamerlane, the Scythian, had exceeding great strength; so that he would draw the string of a Scythian bow (which few were able to deal with) beyond his ear, and caused his arrow to fly with that force, that he would shoot through a brazen mortar, which the archers used to set up for themselves as a mark.—*Jovii Elog. lib.* 2. *p.* 102.—*Reusner de Scorbut. Exercit.* 1. *p.* 29.

8. John Courcy, Baron of Stoke Courcy in Somersetshire, was the first Englishman that subdued Ulster in Ireland, and deservedly was made Earl of it. He was afterwards surprised by Hugh Lacy (co-rival to his title), sent over to England and by King John imprisoned in the Tower of London. A French castle, being in controversy was to have the title thereof tried by combat, the Kings of England and France beholding it. Courcy being a lean lank body, with staring eyes, is sent for out of the Tower, to undertake the Frenchman; and because enfeebled with long confinement, a large bill of fare was allowed him to recruit his strength. The Frenchman hearing how much he had eat and drank, and guessing his courage by his stomach, took him for a cannibal, who would devour him for the last course, and so he declined the combat. Afterwards the two Kings desirous to see some proof of Courcy's strength, caused a steel helmet to be laid on a block before him; Courcy, looking about him with a grim countenance, (as if he intended to cut with his eyes as well as with his arms,) sundered the helmet at one blow, striking his sword so deep into the wood, that none but himself could pull it out again. Be-

ing demanded the cause why he looked so sternly, —" Had I," said he, " failed of my design, I would have killed the Kings, and all in the place." Words well spoken, because well taken—all persons present being then highly in good humour. He died in France, *anno Dom.* 1210.—*Fullworth, p.* 26.—*Somersetshire, Camd. Annals of Ireland, p.* 153, 154.

9. Dr Desaguliers tells us of Thomas Topham, born in London, and then about thirty-one years of age, five feet ten inches high, with muscles very hard and prominent—was brought up a carpenter, which trade he practised till within these six or seven years, that he has showed feats of strength, but was ignorant of any art to make his strength appear more surprising. About six years ago he pulled against a horse, sitting upon the ground, with his feet against two stumps; and although his legs were placed horizontally, instead of rising parallel to the traces of the horse, yet the horse was unable to move him. This induced him to pull against two horses in the same awkward position; but he was raised from his seat, and had one of his knees shattered against the stumps; whereas, had he been properly placed, the Doctor adds, considering his strength, he might have kept his situation against the pulling of four horses, without the least inconvenience. The feats which I saw him perform a few days ago are these:—1. By the strength of his fingers he rolled up a very strong and large pewter dish. 2. He broke seven or eight short and strong pieces of tobacco pipe by the force of his middle finger, having laid them on his first and third finger. 3. Having thrust un-

der his garter the bowl of a strong tobacco pipe, his legs being bent, he broke it to pieces by the tendons of his hams, without altering the bending of his leg. 4. He broke such another bowl between his first and second finger, by pressing them together sideways. 5. He lifted a table six feet long, which had half an hundred weight hanging at the end of it, with his teeth, and held it in a horizontal position for a considerable time. 6. He took an iron kitchen poker, about a yard long, and three inches round, and, holding it in his right hand, he struck upon his bare left arm, between the elbow and the wrist, till he bent the poker nearly to a right-angle. 7. He took such another poker, and holding the ends of it in his hands, and the middle against the back of his neck, he brought both ends of it together before him; and, what was yet more difficult, he pulled it almost strait again. 8. He broke a rope of two inches circumference, although, by his awkward manner, he was obliged to exert four times the strength that was necessary. 9. He lifted a rolling-stone of 800 weight with his hands only, standing in a frame above it, and taking hold of a chain that was fastened to it.—*Vide Desagulier's Exper. Philos. vol. i. p.* 289, *&c.—Wanley's "Wonders of the Little World."*

GIANTS.

As the tallest ears of corn are the lightest in the head; and houses built many stories high have their uppermost rooms the worst furnished; so

those human fabrics, which nature hath raised to a giant-like height, are observed not to have so happy a composition of the brain as other men; like the Pyramids of Egypt, they are rather for ostentation than use, and are remembered in history not for any accomplishment of mind, but only for the magnitude of their bodies.

1. Walter Parsons, born in Staffordshire, was first apprentice to a smith; when he grew so tall, that a hole was made for him in the ground, to stand therein up to the knees, so as to make him adequate with his fellow-workmen. He afterwards was porter to King James; because gates being generally higher than the rest of the building, it was proper that the porter should be taller than other persons. He was proportionable in all parts, and had strength equal to his height, valour equal to his strength, and good temper equal to his valour; so that he disdained to do an injury to any single person. He would take two of the tallest yeomen of the guards in his arms at once, and order them as he pleased. He was seven feet four inches in height.—*Fuller's Worthies, p.* 48.—*Staffordshire.*

2. William Evans was born in Monmouthshire, and may justly be counted the giant of our day; for his stature being full two yards and a half in height, he was porter to King Charles the First, succeeding Walter Parsons in his place, and exceeding him two inches in stature, but far beneath him in equal proportion of body; for he was not only knock-kneed, and splay-footed, but also halted a little; yet he made a shift to dance at an anti-mask at court, where he drew little Jeffery the King's Dwarf out of his pocket, to the no

small wonder and laughter of the beholders.—*Fuller's Worthies, Wales, p.* 54. *Monmouthshire.*

3. The tallest man that hath been seen in our age, was one named Gabara, who in the days of Claudius the late Emperor, was brought out of Arabia. He was nine feet nine inches high.—*Plin. l.* 7. *c.* 16. *p.* 165. *Solin, c.* 5. *p.* 188.

4. Maximinus the Emperor was eight feet and a half in height. He was a Thracian, barbarous, cruel, and hated of all men. He used the bracelet or armlet of his wife as a ring for his thumb, and his shoe was longer by a foot, than that of another man.—*Zuing. Vol.* 2. *l.* 2. *p.* 276. *Capitolin.*

5. Ferdinand Magellan (before he came to those straits which now bear his name) came to the country of the Patagonians, which are giants. Some of these he enticed to come on board his ship. They were of an huge stature, so that the Spaniard's heads reached but to their waist. Two of them he made his prisoners by policy, who there upon roared like bulls. Their feeding was answerable to their vast bulk; for one of them did eat at a meal, a whole basket of biscuits, and drank a great bowl of water at each draught.—*Clark's Mir. c.* 58. *p.* 234. *Purchas. Pilg. vol.* 1. *p.* 35.

6. Commodore Byron, anchored on this coast December 21st, and gives the following account of this monstrous people: "Just as we came to an anchor, I saw with my glass a number of horsemen riding backwards and forwards. As I was very desirous to know what these people were, I ordered out my boat, and went towards the beach, with Mr Marshall, my second lieutenant, and a party of men, Mr Cumming, my first lieutenant, following in the six-oared cutter. When we came

near the shore, we saw about five hundred people, the far greater part of whom were on horseback. They drew up on a stony spit, and kept waving and hallooing; which we understood were invitations to land. When we landed, I drew up my people on the beach, with my officers at their head, and ordered that none should move from that station, till I should call or beckon to them. I then went forward alone towards the Indians. I made signs that one of them should come near; was understood, and one who afterwards proved to be a chief, came towards me. He was of a gigantic stature, and seemed to realize the tales of monsters in a human shape. He had the skin of some wild beast thrown over his shoulders, and was painted so as to make the most hideous appearance I ever beheld. Round one eye was a large circle of white, a circle of black surrounded the other, and the rest of his face was streaked with different colours. I did not measure him; but, if I may judge of his stature by my own, he could not be less than seven feet high. When this frightful colossus came up, we muttered somewhat to each, as a salutation, and I then walked with him towards his companions. There were among them many women, who seemed to be proportionably large; and few of the men were less than the chief who had come forward to meet me. Having looked round upon these enormous goblins with no small astonishment, and, with some difficulty, made those that were galloping up, sit down with the rest, I took a quantity of yellow and white beads, which I distributed amongst them, and which they received with very strong expressions of pleasure. I then took out a whole piece of green silk ri-

band, and, giving the end of it into the hands of one of them, I made the person that sat next take hold of it, and so on, as far as it would reach. All this time they sat very quietly; nor did any of those that held the riband attempt to pull it from the rest. While the riband was thus extended, I took out a pair of scissors, and cut it between each two of the Indians; so that I left about a yard in the possession of every one, which I afterwards tied about their heads. Their orderly behaviour does them honour, especially as my presents could not extend to the whole company. Mr Cumming came up with tobacco; and I could not but smile at the astonishment which I saw expressed in his countenance upon perceiving himself, though six feet two inches high, become at once a pigmy among giants. Our sensations upon seeing 500 people, the shortest of whom were at least six feet six inches high, and bulky in proportion, may easily be imagined."—*Hawkesworth's Voyages for Southern Discoveries, vol. i. p.* 26, *&c.*—*Wanley's "Wonders of the Little World."*

DWARFS.

In the former chapter we had some of the works of Nature written in text. Here we are presented with some of her writing in small characters; wherein many times she hath been so happy as to comprise much in a little compass. The elephant, though so vast of bulk, is not more curious than the smallest sort of insects, where we behold with equal pleasure and wonder, the springs

of life act in those narrow and straight confinements, as regularly as where they have much larger room.

1. Julia, the neice of Augustus, had a little dwarfish fellow, called Coropas, whom she set great store by. He was not above two feet and a hand's breadth in height; and Andromeda, a freed maid of Julia, was of the same height.—*Plin. lib. 7. cap.* 16. *p.* 165.

2. Marcus Varus reporteth, that Marius Maximus, and Marcus Tullius, were but two cubits, or two feet eleven inches high, and yet were they both gentlemen and knights of Rome; and, in truth, we ourselves have seen their bodies, as they lie embalmed, which testify the same thing.—*Plin. lib.* 7. *cap.* 16. *p.* 165.

3. I have seen some men of a very small stature, not by reason of any crookedness in the spine of the back, or legs, but such as were so from their birth, though straight in all their bones. Of this number was John de Estrix of Mechlen, whom I saw when he was brought through Basil to the Duke of Parma, then in Flanders, anno 1592. He was aged 35; he had a long beard, and was no more than three feet high. He could not go up stairs, much less could he get upon a form, but was always lifted up by a servant. He was skilled in three tongues, ingenious and industrious; with whom I played at tables.—*Plater. Observ. lib.* 3. *p.* 581.

4. Augustus Cæsar exhibited in his plays one Lucius, a young man born of honest parents. He was not full two feet high, saith Ravisius. He weighed but seventeen pounds, yet he had a strong

voice.—*Zuing. vol.* 2. *lib.* 2. *p.* 277.—*Sueton. p.* 81. *in Augusto.*

5. In the time of Iamblicus, lived Alypius o Alexandria, a most excellent logician, and a fa mous philosopher, but of so small and little body, that he hardly exceeded a cubit, or one foo five inches and a half in height. Such as behel him would think he was scarce any thing but spi it and soul; so little grew that part of him which wa liable to corruption, that it seemed to be consume into a kind of divine nature.—*Zuing. vol.* 2. *lib* 2. *p.* 278. *Eunap. in Iamblic. Voss. Insti lib.* 1. *cap.* 5. § 19. *p.* 72.

6. Jeffery Hudson was born in 1619 at Lathar in Rutlandshire. His father was a butcher, of stout and corpulent frame. His mother was a goo size. When pregnant she was not cumbersome nor did she need a midwife to bring him into th world. At eight years old, being not half a yar in height, he was taken by the Dutchess of Buck ingham, who clothed him in satin. At a splendi feast given by the Duke, there was a cold pie which being opened, little Jeffery started up i complete armour. Soon after, he was presente to Queen Henrietta Maria. It was a strange con trast to see him and the King's gigantic porte William Evans. In a masque at Court, Evan lugged out of one pocket a long loaf, and littl Jeffery, instead of a piece of cheese, out of th other. He was employed upon a kind of embass to France to bring over the Queen's midwife; an on his return was taken by a Flemish pirate. Thi captivity of his is celebrated by Sir William Dave nant, in a poem called Jeffreidos. ——— H died about the year 1680, being upwards of 6

years of age.—*Gent. Mag. Dec.* 1734. *Wanley's "Wonders of the Little World."*

THE LANGUAGE, INSTINCT, REASON, AND EDUCATION OF THE INFERIOR ANIMALS.

It must have already appeared to the reader, that all other animals, as well as man, are possessed of this natural language of the passions, expressed in signs or tones; and we shall endeavour to evince, that those animals which have preserved themselves from being enslaved by mankind, and are associated in flocks, are also possessed of some artificial language, and some traditional knowledge.

The mother turkey, when she eyes a kite hovering high in air, has either seen her own parents thrown into fear at his presence, or has, by observation, been acquainted with his dangerous designs upon her young. She becomes agitated with fear, and uses the natural language of that passion. Her young ones catch the fear by imitation, and in an instant conceal themselves in the grass. At the same time that she shows her fears by her gesture and deportment, she uses a certain exclamation, *Koe-ut, Koe-ut,* and the young ones afterwards know, when they hear this note, though they do not see their dam, that the presence of their adversary is denounced, and hide themselves as before. The wild tribes of birds have very frequent opportunities of knowing their enemies, by observing the destruction they make among their progeny, of which every year but a small part es-

capes to maturity; but to our domestic birds these opportunities so rarely occur, that their knowledge of their distant enemies must frequently be delivered by tradition, in the manner above explained, through many generations.

This note of danger, as well as the other notes of the mother-turkey, when she calls her flock to their food, or to sleep under her wings, appears to be an artificial language, both as expressed by the mother, and as understood by the progeny. For a hen teaches this language with equal ease to the ducklings she has hatched from suppositious eggs, and educates as her own offspring; and the wagtails, or hedge-sparrows, learn it from the young cuckoo the foster nursling, and supply him with food long after he can fly about, whenever they hear his cuckooing, which, Linnæus tells us, is his call of hunger. And all our domestic animals are readily taught to come to us for food, when we use one tone of voice, and to fly from our anger when we use another.

Rabbits, as they cannot easily articulate sounds, and are formed into societies that live under ground, have a very different method of giving alarm. When danger is threatened, they thump on the ground with one of their hinder feet, and produce a sound that can be heard a great way by animals near the surface of the earth, which would seem to be an artificial sign, both from its singularity, and its aptness to the situation of the animal. The rabbits on the island of Sor, near Senegal, have white flesh, and are well tasted, but do not burrow in the earth, so that we may suspect their digging themselves houses in this cold

climate is an acquired art, as well as their note of alarm.

The barking of dogs is another curious note of alarm, and would seem to be an acquired language, rather than a natural sign; for, in the island of Juan Fernandes, the dogs did not attempt to bark, till some European dogs were put among them, and then they gradually began to imitate them, but in a strange manner at first, as if they were learning a thing that was not natural to them. Linnæus also observes, that the dogs of South America do not bark at strangers. And the European dogs, that have been carried to Guinea, are said in three or four generations to cease to bark, and only howl, like the dogs that are natives of that coast.

A circumstance not dissimilar to this, and equally curious, is mentioned by Kircherus de Musurgia, in his Chapter *de Lusciniis*—"That the young nightingales that are hatched under other birds, never sing till they are instructed by the company of other nightingales." And Johnston affirms, that the nightingales that visit Scotland, have not the same harmony as those of Italy; which would lead us to suspect, that the singing of birds, like human music, is an artificial language rather than a natural expression of passion.

There are many articles of knowledge which the animals in cultivated countries seem to learn very early in their lives, either from each other, or from experience or observation. One of the most general of these is to avoid mankind. There is so great a resemblance in the natural language of the passions of all animals, that we generally know when they are in a pacific, or in a malevolent humour; they have the same knowledge of

us; and hence we can scold them from us, by some tones and gestures, and could possibly attract them to us by others, if they were not already apprised of our general malevolence towards them. Mr Gmelin, Professor at Petersburg, assures us, that in his journey into Siberia, undertaken by order of the Empress of Russia, he saw foxes that expressed no fear of himself or companions, but permitted him to come quite near them, having never seen the human creature before. And Mr Bougainville relates, that at his arrival at the Malowine, or Falkland's Islands, which were not inhabited by men, all the animals came about himself and his people; the fowls settling upon their heads and shoulders, and the quadrupeds running about their feet. From the difficulty of acquiring the confidence of old animals, and the ease of taming young ones, it appears that the fear they all conceive at the sight of mankind, is an acquired article of knowledge.

This knowledge is more nicely understood by rooks, who are formed into societies, and build, as it were, cities over our heads; they evidently distinguish that the danger is greater when the man is armed with a gun. Every one has seen this, who, in the spring of the year, has walked under a rookery with a gun in his hand; the inhabitants of the trees rise on their wings, and scream to the unfledged young to sink into their nests from the sight of the enemy. The vulgar, observing this circumstance so uniformly to occur, assert that rooks can smell gunpowder.

The field-fairs (*turdis pilarus*), which breed in Norway, and come hither in the cold seasons for our winter berries, as they are associated in flocks, and are in a foreign country, have evident marks

of keeping a kind of watch, to remark and announce the appearance of danger. On approaching a tree that is covered with them, they continue fearless, till one at the extremity of the bush, rising on his wing, gives a loud and peculiar note of alarm, when they all immediately fly, except one other, who continues till you approach still nearer, to certify as it were the reality of the danger, and then he also flies off, repeating the note of alarm.

And in the woods about Senegal, there is a bird called *uett-uett*, by the negroes, and *squallers* by the French, which, as soon as they see a man, set up a loud scream, and keep flying round him, as if their intent was to warn other birds, which, upon hearing the cry, immediately take wing. For the same intent, the lesser birds of our climate seem to fly after a hawk, cuckoo, or owl, and scream to prevent their companions from being surprised by the general enemies of themselves, or of their eggs and progeny.

But the lapwing (*charadrius pluvialis, Lin.*), when her unfledged offspring runs about the marshes, where they were hatched, not only gives the note of alarm at the approach of men or dogs, that her young may conceal themselves, but, flying and screaming near the adversary, she appears more solicitous and impatient, as he recedes from her family, and thus endeavours to mislead him, and frequently succeeds in her design. These last instances are so opposite to the situation, rather than to the natures of the creatures, that use them, and are so similar to the actions of men in the same circumstances, that we cannot but believe that they proceed from a similar principle.

On the northern coast of Ireland, a friend of mine saw above a hundred crows at once preying upon mussels. Each crow took a mussel up into the air, twenty or forty yards high, and let it fall on the stones, and thus by breaking the shell, got possession of the animal. A certain philosopher (I think it was Anaxagoras) walking along the sea-shore to gather shells, one of these unlucky birds mistaking his bald head for a stone, dropped a shell fish upon it, and killed at once a philosopher and an oyster.

Our domestic animals that have some liberty, are also possessed of some peculiar traditional knowledge. Dogs and cats have been forced into each others society, though naturally animals of a very different kind, and have hence learned from each other to eat the knot grass, when they are sick, to promote vomiting. I have seen a cat mistake the blade of barley for this grass, which evinces it is an acquired knowledge. They have also learned from each other to cover what they think ought to be concealed. About a spoonful of water was spilt on my hearth, from the teakettle, and I observed a kitten cover it with ashes. Hence, this must also be an acquired art, as the creature mistook the application of it.

To preserve their fur clean, and especially their whiskers, cats wash their faces, and generally quite behind their ears, every time they eat. As they cannot lick those places with their tongues, they first wet the inside of the leg with saliva, and then repeatedly wash their faces with it, which must originally be an effect of reasoning, because a means is used to produce an effect; and seems afterwards

to be taught or acquired by imitation, like the greatest part of human arts.

Mr Leonard, a very intelligent friend of mine, saw a cat catch a trout, by darting upon it in a deep clear water at the mill at Weaford, near Lichfield. The cat belonged to Mr Stanley, who had often seen her catch fish in the same manner, in summer, when the millpool was drawn so low, that the fish could be seen. I have heard of other cats taking fish in shallow water, as they stood on the bank. This seems a natural art of taking their prey in cats, which their acquired delicacy, by domestication, has in general prevented them from using, though their desire of eating fish continues in its original strength.

Mr White, in his ingenious history of Selbourn, was witness to a cat's suckling a young hare, which followed her about the garden, and came jumping to her call of affection. At Elford, near Lichfield, the Reverend Mr Sawley had taken the young ones out of a hare which was shot. They were alive, and the cat, who had just lost her own kittens, carried them away, as it was supposed, to eat them; but it presently appeared, that it was affection, not hunger, which incited her, as she suckled them, and brought them up as their mother.

Other instances of the mistaken application of what has been termed instinct, may be observed in flies in the night, who, mistaking a candle for daylight, approach and perish in the flame. So the putrid smell of the *stapelia* or carrion-flower, allures the large flesh-fly to deposit its young worms in its beautiful petals, which perish there for want of nourishment. This, therefore, cannot be a ne-

cessary instinct, because the creature mistakes the application of it.

Though in this country, horses show little vestiges of policy, yet in the deserts of Tartary, and Siberia, when hunted by the Tartars, they are seen to form a kind of community, set watches to prevent their being surprised, and have commanders who direct, and hasten their flight. In this country, where four or five horses travel in a line, the first always points his ears forward, and the last points his backward, while the intermediate ones seem quite careless in this respect; which, seems a part of policy to prevent surprise—as all animals depend most on the ear to apprise them of the approach of danger, the eye taking in only half the horizon at once; and horses possess a great nicety of this sense.

There are some parts of a horse which he cannot conveniently rub when they itch, as about the shoulder, which he can neither bite with his teeth nor scratch with his hind-foot. When this part itches, he goes to another horse, and gently bites him in the part which he wishes to be bitten, which is immediately done by his intelligent friend. I once observed a young foal thus bite its large mother, who did not choose to drop the grass she had in her mouth, and rubbed her nose against the foal's neck instead of biting it; which evinces that she knew the design of her progeny, and was not governed by a necessary instinct to bite where she was bitten.

Many of our shrubs which would otherwise afford an agreeable food to horses, are armed with thorns and prickles, which secure them from those animals—as the holly, hawthorn, gooseberry

gorse. In the extensive moorlands of Staffordshire, the horses have learned to stamp upon a gorse-bush with one of their fore-feet for a minute together, and when the points are broken, they eat it without injury—which is an art other horses in the fertile part of the county do not possess,—and prick their mouths till they bleed, if they are induced by hunger or caprice to attempt eating gorse.

Swine have a sense of touch as well as of smell at the end of their nose, which they use as a hand, both to root up the soil, and to turn over and examine objects of food, somewhat like the proboscis of an elephant. As they require shelter from the cold in this climate, they have learned to collect straw in their mouths, to make their nest when the wind blows cold; and to call their companions by repeated cries to assist in the work, and add to their warmth by their numerous bedfellows. I have observed great sagacity in swine; but the short lives we allow them, and their general confinement, prevents their improvement, which might probably be otherwise greater than that of dogs.

Instances of the sagacity and knowledge of animals are very numerous to every observer; and docility in learning various arts from mankind, evinces that they may learn similar arts from their own species, and thus be possessed of much acquired and traditional knowledge.

A dog, whose natural prey is sheep, is taught by mankind not only to leave them unmolested, but to guard them; and to hunt, to set, or to destroy other kinds of animals, as birds or vermin; and in some countries to catch fish, in others to

find truffle, and to practise a great variety tricks ; is it more surprising that the crows shou teach each other, that the hawk can catch le birds, by the superior swiftness of his wing ; a if two of them follow him till he succeeds in l design, that they can by force share a part of t capture ? This I have formerly observed with tention and astonishment.

The knowledge and language of those birds th frequently change their climate with the seasc is still more extensive, as they perform these n grations in large societies, and are less subject the power of man than the resident tribes of bir They are said to follow a leader during the d who is occasionally changed, and to keep a con nual cry during the night, to keep themselves gether. It is probable that these emigratic were at first undertaken as accident directed, the more adventurous of their species, and learn from one another like the discoveries of manki in navigation. The following circumstances stro ly support this opinion.

1. Nature has provided these animals, in t climates where they are produced, with anotl resource when the season becomes too cold their constitutions, or the food they were suppo ed with ceases to be supplied, I mean that of sle ing. Dormice, snakes, and bats, have not the mea of changing their country ; the two former fr the want of wings, and the latter from his bei not able to bear the light of day. Hence the animals are obliged to make use of this resour and sleep during the winter. And those swallo that have been hatched too late in the year to a quire their full strength of pinion, or that ha

been maimed by accident or disease, have been frequently found in the hollows of rocks on the sea-coasts, and even under water in this torpid state, from which they have been revived by the warmth of a fire. This torpid state of swallows is testified by innumerable evidences, both of ancient and modern names. Aristotle, speaking of the swallows, says, "They pass into warmer climates in winter, if such places are at no great distance; if they are, they bury themselves in the climates where they dwell." Hence their emigrations cannot depend on a *necessary* instinct, as the emigrations themselves are not *necessary!*

2. When the weather becomes cold, the swallows in the neighbourhood assemble in large flocks, that is, the unexperienced attend those that have before experienced the journey they are about to undertake. They are then seen some time to hover on the coast till there is calm weather, or a wind that suits the direction of their flight. Other birds of passage have been drowned by thousands in the sea, or have settled on ships, quite exhausted with fatigue. And others, either by mistaking their course, or by distress of weather, have arrived in countries where they were never seen before; and thus are evidently subject to the same hazards that the human species undergo, in the execution of their artificial purposes.

3. The same birds are emigrant from some countries, and not so from others. The swallows were seen at Goree in January by an ingenious philosopher of my acquaintance, and he was told that they continued there all the year; as the warmth of the climate was at all seasons sufficient for their own constitutions, and for the production

of the flies that supply them with nourishmen Herodotus says, that in Libya, about the spring of the Nile, the swallows continue all the year.

From all these circumstances, it appears th the migrations of birds are not produced by a n cessary instinct, but are accidental improvement like the arts among mankind, taught by their c temporaries, or delivered by tradition from o generation of them to another.—*Dr Darwin Zoonomia.*

TABLE OF THE MIGRATION OF BRITISH BIRD

	First seen.	Last seen.
Swallow,	April 18.	Oct. 31.
Martin,	March 4.	Oct. 16.
Sand Martin,	March 26.	Sept. 12.
Swift,	May 9.	Sept. 3.
Goat Sucker,	. .	Sept. 27.
Turtle Dove,	June 5.	Aug. 10.
Wry Neck,	March 26.	Sept. —
Cuckoo,	May 1.	Aug. 10.
Nightingale,	April 25.	Sept. 20.
Black-cap,	May 10.	Sept. 18.
White-throat,	April 22.	Sept. 16.
White-ear,	May 4.	Sept. 26.
Whinchat,	June 1.	Sept. 21.
Redstart,	April 24.	Sept. 1.
Willow-wren,	April 23.	Sept. 24.
Fly-catcher,	May 8.	Sept. 30.
Red-backed Shrike,	June 1.	Aug. 16.
Land-rail,	. .	Oct. 20.
Quail,	Aug. 20.	

	First seen.	Last seen.
Fieldfare, .	Nov. 21.	April 10.
Red-wing, .	Nov. 10.	March 18.
Woodcock, .	Oct. 20.	April 1.
Snipe, . .	Nov. 20.	March 20.
Jack Snipe, .	Dec. 26.	March 16.
Sea Lark, . .	April 1.	
Greater Tern, .	April 1.	Oct. 8.
Lesser Tern, .	May 20.	Oct. 16.
Royston Crow, .	May 22.	March 29.

—*Shaw's Nature Displayed.*

BIRDS' NESTS—THE INGENUITY EVINCED IN THEIR CONSTRUCTION.

THEY seem to be instructed how to build their nests from their observation of that in which they were educated, and from their knowledge of those things that are most agreeable to their touch in respect to warmth, cleanliness, and stability. They choose their situations from their ideas of safety from their enemies, and of shelter from the weather. Nor is the colour of their nests a circumstance unthought of; the finches, that build in green hedges, cover their habitations with green moss; the swallow, or martin, that builds against rocks and houses, covers her's with clay, whilst the lark chooses vegetable straw nearly of the colour of the ground she inhabits; by this contrivance, they are all less liable to be discovered by their adversaries.

Nor are the nests of the same species of birds constructed always of the same materials, nor in

the same form; which is another circumstanc that ascertains that they are led by observation.

In the trees before Mr Levet's house in Licl field, there are annually nests built by sparrow a bird which usually builds under the tiles houses, or the thatch of barns. Not finding su convenient situations for their nests, they build covered nest bigger than a man's head, with opening like a mouth at the side, resembling th of a magpie, except that it is built with straw a hay, and lined with feathers, and so nicely manag as to be a defence against both wind and rain.

So the jackdaw *(corvus monedula)* general builds in church steeples, or under the roofs high houses: but at Selbourn in Southampto shire, where towers and steeples are not sufficie ly numerous, these same birds build in forsak rabbit burrows. See a curious account of th subterranean nests in White's History of Selbou p. 59. Can the skilful change of architecture these birds and the sparrows above mentioned governed by instinct? Then they must have t instincts, one for common, and the other for traordinary occasions. I have seen green worst in a nest, which nowhere exists in nature; and down of thistles in those nests, that were by so accident constructed later in the summer, wh material could not be procured for the earl nests. In many different climates they cannot p cure the same materials that they use in ou And it is well known, that the canary birds t are propagated in this country, and the finc that are kept tame, will build their nests of a flexible materials that are given them. Plutar in his book on Rivers, speaking of the Nile, sa

" that the swallows collect a material, when the waters recede, with which they form nests that are impervious to water." And in India there is a swallow that collects a glutinous substance for this purpose, whose nest is esculent, and esteemed a principal rarity amongst epicures. Both these must be constructed of very different materials from those used by the swallows of our country.

In India the birds exert more artifice in building their nests on account of the monkeys and snakes. Some form their pensile nests in the shape of a purse, deep and open at top; others with a hole in the side; and others, still more cautious, with an entrance at the very bottom, forming their lodge near the summit. But the taylor bird will not even trust its nest to the extremity of a tender twig, but makes one more advance to safety by fixing it to the leaf itself. It picks up a dead leaf and sews it to the side of a living one, its slender bill being its needle, and its thread some fine fibres; the lining consists of feathers, gossamer, and down; its eggs are white, the colour of the bird light yellow, its length three inches, its weight three-sixteenths of an ounce; so that the materials of the nest, and the weight of the bird, are not likely to draw down an habitation so slightly suspended. A nest of this bird is preserved in the British Museum. This calls to one's mind the Mosaic account of the origin of mankind, the first dawning of art there ascribed to them, is that of sewing leaves together.

Those birds that are brought up by our care, and have had little communication with others of their own species, are very defective in this acquired knowledge; they are not only very awk-

ward in the construction of their nests, but generally scatter their eggs in various parts of the room or cage, where they are confined, and seldom produce young ones, till, by failing in their first attempt, they have learnt something from their own observation.

During the time of incubation birds are said in general to turn their eggs every day. Some cover them when they leave the nest, as ducks and geese. In some the male is said to bring food to the female that she may have less occasion of absence; in others he is said to take her place, when she goes in quest of food, and all of them are said to leave their eggs a shorter time in cold weather than in warm. In Senegal the ostrich sits on her eggs only during the night, leaving them in the day to the heat of the sun; but at the Cape of Good Hope, where the heat is less, she sits on them day and night.

If it should be asked what induces a bird to sit weeks on its first eggs, unconscious that a brood of young ones will be the product? The answer must be that it is the same passion that induces the human mother, to hold her offspring whole nights and days in her fond arms, and press it to her bosom, unconscious of its future growth to sense and manhood, till observation or tradition have informed her. And as many ladies are too refined to nurse their own children, and deliver them to the care and provision of others, so is there one instance of this vice in the feathered world. The cuckoo in some parts of England, as I am well informed by a very distinct and ingenious gentleman, hatches and educates her own young; whilst in other parts, she builds no nest,

but uses that of some lesser bird, generally either of the wagtail or hedge-sparrow, and depositing one egg in it, takes no further care of her progeny.—*Dr Darwin's Zoonomia.*

THE HUMMING BIRD.

THERE is in most parts of America a bird, called by the English the humming bird, by the Spaniards *tomincius.* He is of a most excellent shining green colour, and very resplendent, the colour doth something resemble some of our English drake's heads. It doth inhabit in some of the colder parts of America, as well as in the hotter. It is the least of all birds that I have seen there or in England, her leg and foot together is but half an inch, the other parts answerable; the trunk of her body not an inch. I did weigh one in those parts as soon as ever it was killed, whose weight was the tenth part of an ounce *avoirdupois,* which I take to be about the weight of a coined sixpence. And I have weighed here in England a titmouse, (which I take to be the least bird here), and it weighed above two shillings, and some half a-crown. I saw one of their nests made of cotton wool, in form and bigness of the thumb of a man's glove, with the taper end set downwards, wherein were two eggs of the bigness of a pea, of oval form. They feed by thrusting their bill and tongue into the blossoms of trees, and so suck the sweet juice of honey from them; and when he sucks he sits not, but bears up his body with a hovering motion of his wings

But for the relation that he is a curious singing bird, I think it untrue. An Indian soggamore is not in his full pomp and bravery without one of these birds in his ear for a pendant. He is called the *hum* bird or *humming* bird, because some say he makes a noise like a spinning wheel when he flies. But I have been many times very near them, both when they hovered, and when they did fly, and I never hard any noise; besides, their body and wings are too small to strike air enough to make any noise. But of this I shall not be positive, because some authors are opposite to me. It is a solitary bird. I never saw but two at a time together, viz. the male and female; they being easily known when together, the male being somewhat bigger than the female.—*Phil. Trans. Vol. II.*

PARROTS—CURIOUS INSTANCES OF THEIR SAGACITY.

THE common ash-coloured parrot is the well known species which is now most commonly brought into Europe. It is superior to most others, both in the facility, and the eagerness with which it imitates the human voice. It listens with attention and strives to repeat. It dwells constantly on some syllables which it has heard, and seeks to surpass every voice by the loudness of its own.

A parrot which Colonel O'Kelly bought for an hundred guineas at Bristol, not only repeated a great number of sentences, but answered many questions; it was also able to whistle many tunes.

It beat time with all the appearance of science; and so accurate was its judgment, that if, by chance, it mistook a note, it would revert to the bar where the mistake was made, correct itself, and, still beating regular time, go through the whole with wonderful exactness. Its death was thus announced in the General Evening Post for the 9th of October 1802:—"A few days ago, died in Half-Moon Street, Piccadilly, the celebrated parrot of Colonel O'Kelly. This singular bird sang a number of songs in perfect time and tune. She could express her wants articulately, and give her orders in a manner approaching nearly to rationality. Her age was not known; it was, however, more than thirty years; for previously to that period, Colonel O'Kelly bought her at Bristol for a hundred guineas. The Colonel was repeatedly offered five hundred guineas a-year for the bird, by persons who wished to make a public exhibition of her; but this, out of tenderness to the favourite, he constantly refused. The bird was dissected by Dr Kennedy and Mr Brookes; and the muscles of the larynx, which regulate the voice, were found, from the effect of practice, to be uncommonly strong."

Dr Goldsmith relates that a parrot, belonging to King Henry the Seventh, having been kept in a room next the Thames, in his palace at Westminister, had learned to repeat many sentences from the boatmen and passengers. One day, sporting on its perch, it unluckily fell into the water. The bird had no sooner discovered its situation than it called out aloud, "A boat! twenty pounds for a boat!" A waterman, happening to be near the place where the parrot was floating, immediately took it up, and restored it to the King, de-

manding, as the bird was a favourite, that he should be paid the reward it had called out. This was refused; but it was agreed that, as the parrot had offered a reward, the man should again refer to its determination for the sum he was to receive. "Give the knave a groat," the bird screamed aloud the instant the reference was made.

Mr Locke, in his Essay on the Human Understanding, relates the following anecdote concerning a parrot. During the government of Prince Maurice in Brazil, he had heard of an old parrot that was much celebrated for answering, like a rational creature, many of the common questions that were put to it. The curiosity of the Prince was roused and he directed it to be sent for. When it was introduced into the room where the Prince was sitting in company with several Dutchmen, it immediately exclaimed in the Brazilian language "What a company of white men are here?" The asked, "Who is that man?" (pointing to the Prince), the parrot answered, "Some general or other." When the attendants carried it up to him he asked, through the medium of an interpreter "From what place do you come?" The parrot answered, "From Marignan." The Prince asked "To whom do you belong?" It answered, "To a Portuguese." He asked again, "What do you do there?" It answered, "I look after chickens!" The parrot in answer, said, "Yes, I and I know well enough how to do it;" clucking at the same time, in imitation of the noise made by the hen to call together her young ones.

Madame Nadault, sister to Buffon, had a parrot which often spoke to his paw, and answered by holding it up. He loved the voice of children, ye

hated themselves, pursued and bit them till he drew blood. He had also his objects of attachments; and though his choice was not very nice, it was constant. He was very fond of a cook-maid, followed and sought her, and seldom missed finding her. If she had been some time out of his sight, the bird climbed with his bill and claws to her shoulders, lavished his caresses, and would on no account quit her; his fondness had all the marks of close and warm friendship. The girl happened to have a very sore finger, which was tedious in healing, and so painful as to make her scream; while she uttered her moans, the parrot never left her chamber. The first thing he did every day, was to pay her a visit; and this tender condolence continued the whole time of the cure, when he returned to his calm settled attachment. Yet this strong predilection seems to have been more to the office of the girl in the kitchen, than to her person; for, when another cook-maid succeeded her, the parrot showed the same fondness the very first day.

The power of imitating exactly articulate discourse, implies in the parrot a very peculiar and perfect structure of organ; and the accuracy of its memory, (though independent of understanding), manifests a closeness of attention, and a strength of mechanical recollection, that no other bird possesses in so high a degree. Accordingly all naturalists have remarked the singular form of its bill, of its tongue, and its head. Its bill, round on the outside and hollow within, has, in some degree the capacity of a mouth, and allows the tongue to play freely; and the sound, striking against the circular border of the lower mandible, is there mo-

dified as on a row of teeth, while the concavity of the upper mandible reflects it like a palate; hence the animal does not utter a whistling sound, but a full articulation. The tongue, which modulates all sounds, is proportionally larger than in man; and would be more voluble, were it not harder than flesh, and invested with a strong horny membrane. From the peculiar structure of the upper mandible of its bill, the parrot has a power, which no other birds have, of chewing its food. It seizes its food sideways, and gnaws it deliberately. The lower mandible has very little motion, but that from right to left is most perceptible; and this is often performed when the bird is not eating, whence some persons have supposed it to ruminate. In such cases, however, the bird may be only whetting the edge of this mandible, with which it cuts and bites its aliment.—*Shaw's Nature Displayed.*

THE BEAVER—ITS HABITS AND PECULIARITIES.

In proportion as man rises above a state of nature, the other animals sink below that standard. Reduced to slavery, or treated as rebels, and dispersed by force, their societies have vanished, their industry has become barren, their arts have disappeared, each species has lost its general qualities, and the whole have preserved only their individual properties, matured, in some, by example, by imitation, and by instruction; and, in others, by fear, and by the necessity of perpetually watching over their own safety. What views, what designs can be possessed by slaves without spirit, or

exiles without power? Compelled to fly, and to exist in a solitary manner, they can arrive at no improvement; they can neither acquire nor transmit knowledge; but must continually languish in calamity, and decay; they must perpetuate without multiplying; and, in a word, they must lose by their duration more than they acquire by experience.

It is for this reason that there are now no remains of that astonishing industry of animals, excepting in those distant and desert regions where, for a long succession of ages, they have received no disturbance from man, where each species can display with freedom its natural talents, and mature them in quiet, by uniting into permanent societies. The beavers afford, perhaps, the only subsisting monument of the ancient intelligence of brutes, which, though infinitely inferior in principle to the human intellect, supposes common projects and relative views; projects which, having society for their basis, and, for their object, a dike to construct, a town to build, or a republic to found, imply some mode of making themselves understood, and the capacity of acting in concert.

The beavers are said to be, among quadrupeds, what the bees are among the insect tribes. There are in Nature, as she now appears, three species of societies, which must be examined before we can compare them. The free society of man, from which, next to God, he derives all his power; the constrained society of the larger animals, which always flies before that of man; and the necessary society of certain small creatures, which, being all produced at the same time, and in the same place, are obliged to live together. An individual, soli-

tary as he comes from the hand of Nature, is a sterile being, whose industry is limited to the simple use of his senses. Even man himself, in a state of pure nature, deprived of the light and assistance of society, neither produces nor constructs. Fertility, on the contrary, is the necessary result of every society, however blind or fortuitous, provided it be composed of creatures of the same nature. From the necessity alone of desiring to approach or to avoid each other, common movements arise, from which there often results a work, that has the air of being concerted, managed, and executed with intelligence. Thus, the works of bees, each of whom, in a given place, such as a hive, or the hollow of an old tree, builds a cell; the works of the Cayenne bee, or fly, who not only makes the cells, but the hive that is to contain them, are operations purely mechanical, and imply no intelligence, no concerted project, no general views; they are labours which, being the produce of a physical necessity, a result of common movements, are at all times, and in all places, uniformly executed in the same manner, by a multitude, not assembled from choice, but united by the force of nature. Hence, it is not society, but numbers alone, which operate here. It is a blind power, never to be compared to that light by which all society is directed. I speak not of that pure light, that ray of divinity, which has been imparted to man alone. Of this the beavers, as well as all the other animals, are most assuredly deprived. But their society, not being a union of constraint, but proceeding from a species of choice, and supposing, at least, a general concert and common views in its members, implies likewise a certain degree of in-

telligence, which, though different in principle from that of man, produces effects so similar as to admit of comparison, not, indeed, to the luminous society of polished nations, but to the rudiments of it, as they appear among savages, whose union and operations can alone, with propriety, be compared to those of certain animals.

Let us, then, examine the product of each of these associations; let us see how far the art of the beaver extends, and to what the talents of the savage is limited. To break a branch, and to make a staff of it,—to build a hut, and to cover it with leaves, for shelter, and to collect hay or moss, and to make a bed of these materials, are operations common to the animal and to the savage. The beavers build huts, the monkeys carry staves, and several other animals make commodious and neat houses, which are impenetrable by water. To sharpen a stone by friction, and make a hatchet of it, to use this hatchet for cutting or peeling the bark off trees, for pointing arrows, for hollowing a vessel, or for slaying an animal in order to clothe themselves with its skin, to make bow-strings of its sinews, to fix the sinews to a hard thorn or bone, and to use these for needles and thread, are actions purely individual, which man in solitude may perform without the aid of others—actions which solely depend on conformation, because they suppose nothing but the use of the hand. But, to cut and transport a large tree, to build a village, or to construct a large canoe, are operations, on the contrary, which necessarily suppose common labour and concerted views. These works are the results of infant society in savage nations; but the

operations of the beavers are the fruits of society already matured among those animals; for it must be remarked, that they never think of building but in countries where they are perfectly free and undisturbed. There are beavers in Languedoc and in the islands of the Rhone; and they abound in many of the northern provinces of Europe But, as all these countries are inhabited, or, at least, frequented by men, the beavers there, like all the other animals, are dispersed, solitary, fugitive, and timid creatures. They have never been known to unite, or to construct any common work But, in desert regions, where men in society were long of arriving, and where some vestiges only of savages could be traced, the beavers have ever where united, formed associations, and constructed works which continue to excite admiration. On this I shall endeavour to quote the most judicious and irreproachable authorities, and shall hold as certain only those facts concerning which authors agree. Less inclined, perhaps, than some of them to indulge admiration, I shall venture to doubt and even to criticise, every article that appears to hard to be credited.

It is universally allowed, that the beaver, in his purely individual qualities, instead of possessing any marked superiority over the other animals appears, on the contrary, to sink considerably below some of some. And we are enabled to confirm this fact, being possessed of a young beaver sent us from Canada, which we have kept alive near twelve months. This animal is very gentle peaceable, and familiar. It is somewhat melancholy, and even plaintive; but has no violence or vehemence in its passions. Its movements are

slow, and its efforts feeble; yet it is seriously occupied with a desire of liberty, gnawing, from time to time, the gates of its prison, but without fury or precipitation, and with the sole view of making an opening for its escape. In other matters, it seems to be extremely indifferent, forming no attachments, and neither wishes to hurt nor to please. In these relative qualities, which would make him approach to man, he seems to be inferior to the dog. He appears to be formed neither for serving, commanding, nor even holding commerce with any other species than his own. His sense, locked up in his own person, never entirely manifests itself but among his own tribe. When alone, he has little personal industry, less artifice, and hardly prudence enough to avoid the grossest snares. Instead of attacking other animals, he is even very awkward in defending himself. He prefers flight to combat, though he bites cruelly when he finds himself seized by the hand of the hunter.

If, then, we consider this animal in a state of nature, or rather in a state of solitude and dispersion, he appears not, by his internal qualities, to rise above the other animals. He has not the genius of a dog, the sense of an elephant, the craftiness of the fox, &c. but is more remarkable for some singularities of external conformation, than for any apparent superiority of mental faculties. He is the only quadruped furnished with a flat, oval tail, covered with scales, which he uses as a rudder to direct his course in the water; the only animal that has his hind-feet webbed, and the toes of his fore-feet, which he employs for carrying victuals to his mouth, separate from each other;

the only quadruped that resembles the land-animals in the anterior parts of his body, and the aquatic animals in the posterior. He forms the link between quadrupeds and fishes, as the bat does between quadrupeds and birds. But these peculiarities would be rather defects than perfections, if the beaver knew not how to derive, from this singular conformation, advantages which render him superior to every other quadruped.

The beavers begin to assemble, in the month of June or July, for the purpose of uniting into society. They arrive in numbers, from all corners, and soon form a troop of two or three hundred. The place of rendezvous is generally the situation fixed for their establishment, and is always on the banks of waters. If the waters be flat, and never rise above their ordinary level, as in lakes, the beavers make no bank or dam. But, in rivers or brooks, where the waters are subject to risings and fallings, they build a bank, and, by this artifice, they form a pond or piece of water which remains always at the same height. The bank traverses the river, from one side to the other, like a sluice, and it is often from eighty to one hundred feet long, by ten or twelve broad at the base. This pile, for animals of a size so small, appears to be enormous, and supposes an incredible labour.* But the solidity with which the work is constructed, is still more astonishing than its magnitude. The part of the river where they erect this bank is generally shallow. If they find on the margin a

* The largest beavers weigh fifty or sixty pounds, and exceed not three feet in length, from the end of the muzzle to the origin of the tail.

large tree, which can be made to fall into the water, they begin with cutting it down, to form the principal part of their work. This tree is often thicker than the body of a man. By gnawing the foot of the tree with their four cutting teeth, they accomplish their purpose in a very short time, and always make the tree fall across the river. They next cut the branches from the trunk, to make it lie level. These operations are performed by the whole community. Several beavers are employed in gnawing the foot of the tree, and others in lopping off the branches after it has fallen. Others, at the same time, traverse the banks of the river, and cut down smaller trees, from the size of a man's leg to that of his thigh. These they dress, and cut to a certain length, to make stakes of them, and first drag them by land to the margin of the river, and then by water to the place where the building is carrying on. These piles they sink down, and interweave the branches with the larger stakes. This operation implies the vanquishing of many difficulties; for, to dress these stakes, and to put them in a situation nearly perpendicular, some of the beavers must elevate, with their teeth, the thick ends against the margin of the river, or against the cross-tree, while others plunge to the bottom, and dig holes with their fore-feet, to receive the points, that they may stand on end. When some are labouring in this manner, others bring earth, which they plash with their feet, and beat firm with their tails. They carry the earth in their mouths, and with their fore-feet, and transport it in such quantities, that they fill with it all the intervals between the piles. These piles con-

sist of several rows of stakes, of equal height, all placed opposite to each other, and extend from one bank of the river to the other. The stakes facing the under part of the river, are placed perpendicularly; but the rest of the work slopes upwards to sustain the pressure of the fluid; so that the bank, which is ten or twelve feet wide at the base, is reduced to two or three at the top. It has, therefore, not only all the necessary thickness and solidity, but the most advantageous form for supporting the weight of the water, for preventing its issue, and to repel its efforts. Near the top, or thinnest part of the bank, they make two or three sloping holes, to allow the surface-water to escape, and these they enlarge or contract, according as the river rises or falls; and, when any breaches are made in the bank, by sudden or violent inundations, they know how to repair them as soon as the water subsides.

It would be superfluous, after this account of their public work, to give a detail of their particular operations, were it not necessary, in a history of these animals, to mention every fact, and were not the first great structure made with a view to render their smaller habitations more commodious. These cabins or houses are built upon piles near the margin of the pond, and have two openings, the one for going to the land, and the other for throwing themselves into the water. The form of the edifices is either oval or round, some of them larger and some less, varying from four or five to eight or ten feet diameter. Some of them consist of three or four stories; and their walls are about two feet thick, raised perpendiculary upon planks, or plain stakes, which serve both for foundations

and floors to their houses. When they consist but of one story, the walls rise perpendicularly only a few feet, afterwards assume a curved form, and terminate in a dome or vault, which serves them for a roof. They are built with amazing solidity, and neatly plastered both without and within. They are impenetrable to rain, and resist the most impetuous winds. The partitions are covered with a kind of stucco, as nicely plastered as if it had been executed by the hand of man. In the application of this mortar, their tails serve for trowels, and their feet for plashing. They employ different materials, as wood, stone, and a kind of sandy earth, which is not subject to dissolution in water. The wood they use is almost all of the light and tender kinds, as alders, poplars, and willows, which generally grow on the banks of rivers, and are more easily barked, cut, and transported, than the heavier and more solid species of timber. When they once attack a tree, they never abandon it till they cut it down, and carry it off. They always begin the operation of cutting at a foot, or a foot and a half above the ground. They labour in a sitting posture; and, beside the convenience of this situation, they enjoy the pleasure of gnawing perpetually the bark and wood, which are most palatable to their taste; for they prefer fresh bark and tender wood to most of their ordinary aliment. Of these provisions they lay up ample stores, to support them during the winter; but they are not fond of dry wood. It is in the water, and near their habitations, that they establish their magazines. Each cabin has its own magazine, proportioned to the number of its inhabitants, who have all a common right to the store, and never pillage their neigh-

bours. Some villages are composed of twenty or twenty-five cabins. But these large establishments are rare; and the common republic seldom exceeds ten or twelve families, of which each has his own quarter of the village, his own magazine, and his separate habitation. They allow not strangers to set down in their neighbourhood. The smallest cabins contain two, four, or six; and the largest eighteen, twenty, and, it is alleged, sometimes thirty beavers. They are almost always equally paired, being the same number of females as of males. Thus, upon a moderate computation, the society is often composed of 150 or 200, who all, at first, laboured jointly in raising the great public building, and afterwards, in select tribes or companies, in making particular habitations. In this society, however numerous, an universal peace is maintained. Their union is cemented by common labours; and it is rendered perpetual by mutual convenience, and the abundance of provisions which they amass and consume together. Moderate appetites, a simple taste, an aversion against blood and carnage, deprive them of the idea of rapine and war. They enjoy every possible good, while man only knows how to pant after it. Friends to each other, if they have some foreign enemies, they know how to avoid them. When danger approaches, they advertise one another, by striking their tail on the surface of the water, the noise of which is heard at a great distance, and resounds through all the vaults of their habitations. Each takes his part; some plunge into the lake, others conceal themselves within their walls, which can only be penetrated by the fire of heaven, or the steel of man, and which no animal will attempt

either to open or to overturn. These retreats are not only very safe, but neat and commodious. The floors are spread over with verdure. The branches of the box and the fir serve them for carpets, upon which they permit not the least dirtiness. The window that faces the water answers for a balcony to receive the fresh air, and to bathe. During the greatest part of the day, they sit on end, with their head and anterior parts of the body elevated, and their posterior parts sunk in the water. This window is made with caution, the aperture of which is sufficiently raised to prevent its being stopped up with the ice, which, in the beaver climates, is often two or three feet thick. When this happens, they slope the sole of the window, cut obliquely the stakes which support it, and thus open a communication with the unfrozen water. This element is so necessary, or rather so agreeable to them, that they can seldom dispense with it. They often swim a long way under the ice. It is then that they are most easily taken, by attacking the cabin on one hand, and, at the same time watching at a hole made at some distance, where they are obliged to repair for the purposes of respiration. The continual habit of keeping their tail and posterior parts in the water, appears to have changed the nature of their flesh. That of their anterior parts, as far as the reins, has the taste and consistence of the flesh of land or air animals; but that of the tail and posteriors has the odour and all the other qualities of fish. The tail, which is a foot long, an inch thick, and five or six inches broad, is even an extremity or genuine portion of a fish, attached to the body of a quadruped. It is entirely covered with scales, and with a skin perfectly similar to

those of large fishes. They may be scraped off with a knife, and, after falling, they leave an impression on the skin, as is the case with all fishes.

It is in the beginning of summer that the beavers assemble. They employ the months of July and August in the construction of their bank and cabins. They collect, in September, their provisions of bark and wood. Afterwards they enjoy the fruits of their labours, and taste the sweets of domestic happiness. This is the time of repose, and the season of love. Knowing and loving one another from habit, from the pleasures and fatigues of a common labour, each couple join not by chance, nor by the pressing necessities of nature, but unite from choice and from taste. They pass together the autumn and the winter. Perfectly satisfied with each other, they never separate. At ease in their cabins, they go not out but upon agreeable or useful excursions, to bring in supplies of fresh bark, which they prefer to what is too dry or too much moistened with water. The females are said to go pregnant for four months; they bring forth in the end of winter, and generally produce two or three young ones. About this time, they are left by the males, who retire to the country to enjoy the pleasures and the fruits of the spring. They return, occasionally, to their cabins; but dwell there no more. The mothers continue in the cabins, and are occupied in nursing, protecting, and rearing their young, who, at the end of a few weeks, are in a condition to follow their dams. The females, in their turn, make little excursions to recruit themselves by the air, by eating fishes, crabs, and fresh bark, and, in this manner, pass the summer upon the waters,

and in the woods. They assemble not again till autumn, unless their banks or cabins be overturned by inundations; for, when accidents of this kind happen, they suddenly collect their forces, in order to repair the breaches which have been made.

Some places they prefer to others for their habitation; and they have been observed, after having their labours frequently destroyed, to return every summer to repair them, till, being fatigued with this persecution, and weakened by the loss of several of their numbers, they took the resolution of changing their abode, and of retiring to solitudes still more profound. It is in winter that they are chiefly sought by the hunters, because their fur is not perfectly sound in any other season: And, after their village is ruined, and numbers of them are taken, the society is sometimes too much reduced to admit of a fresh establishment; but those which escape death or captivity, disperse and become vagabond. Their genius, withered by fear, never again expands. They hide themselves, and their talents, in holes, or, sunk to the condition of other animals, they lead a timid and a solitary life. Occupied only by pressing wants, and exerting solely their individual powers, they lose forever those social qualities which we have been so justly admiring.

However marvellous the society and the operations I have now described may appear, it is impossible to doubt of their reality. All the facts mentioned by numbers of eyewitnesses, correspond with those I have related: And, if my narration differ from some which have been given, it is only in a few points that I judged too marvel-

lous and improbable to be credited.—*Buffon's Natural History.*

ELEPHANTS AND MAMMOTHS.

Of this genus, two species are at present known as inhabitants of the earth. The one, which is confined to Africa, is named the African elephant; the other, which is a native of Asia, is named the Asiatic elephant. Only one fossil species has hitherto been discovered. It is the *Mammoth* of the Russians. It differs from both the existing species, but agrees more nearly with the Asiatic than the African species. Its bones have been found in many different parts of this island; as in the alluvial soil around London, in the county of Northampton, at Gloucester, at Trenton, near Stafford, near Harwich, at Norwich, in the island of Sheppey, in the river Medway, in Salisbury Plain, and in Flintshire in Wales; and similar remains have been dug up in the north of Ireland. Bones of this animal have been dug up in Sweden: and Cuvier conjectures, that the bones of supposed giants, mentioned by the celebrated Bishop Pontoppidan, as having been found in Norway, are remains of the fossil elephant. Torfæus mentions a head and tooth of this animal, dug up in the island of Iceland. In Russia, in Europe, Poland, Germany, France, Holland, and Hungary, teeth and bones of this species of elephant have been found in abundance. Humboldt found teeth of this animal in north and south America. But it is in Asiatic Russia, that they

occur in greatest abundance. Pallas says, that from the Don or the Tanais, to Tchutskoinoss, there is scarcely a river the bank of which does not afford remains of the mammoth, and these are frequently imbedded in, or covered with, alluvial soil, containing marine productions. The bones are generally dispersed, seldom occurring in complete skeletons, and still more rarely do we find the fleshy part of the animal reserved. One of the most interesting instances on record, of the preservation of the carcass of this animal, is given by M. Cuvier, in the following relation:

"In the year 1799, a Tungusian fisherman observed a strange shapeless mass projecting from an ice-bank, near the mouth of a river in the north of Siberia, the nature of which he did not understand, and which was so high in the bank as to be beyond his reach. He, next year, observed the same object, which was then rather more disengaged from among the ice, but was still unable to conceive what it was. Towards the end of the following summer, 1801, he could distinctly see, that it was the frozen carcass of an enormous animal, the entire flank of which, and one of its tusks, had become disengaged from the ice. In consequence of the ice beginning to melt earlier, and to a greater degree than usual in 1803, the fifth year of this discovery, the enormous carcass became entirely disengaged, and fell down from the ice-crag, on a sand-bank forming part of the coast of the Arctic ocean. In the month of March of that year, the Tungusian carried away the two tusks, which he sold for the value of fifty rubles; and at this time a drawing was made of the animal, of which I possess a copy.

"Two years afterwards, or in 1806, Mr Adams went to examine this animal, which still remained on the sand-bank, where it had fallen from the ice, but its body was then greatly mutilated. The *Jukuts* of the neighbourhood, had taken away considerable quantities of its flesh to feed their dogs and the wild animals, particularly the white bears, had also feasted on the carcass; yet the skeleton remained quite entire, except that one of the fore-legs was gone. The entire spine, the pelvis, one shoulder-blade, and three legs, were still held together by their ligaments, and by some remains of the skin; and the other shoulder-blade was found at a short distance. The head remained covered by the dried skin, and the pupil of the eyes was still distinguishable. The brain also remained within the skull, but a good deal shrunk and dried up; and one of the ears was in excellent preservation, still retaining a tuft of strong bristly hair. The upper-lip was a good deal eaten away, and the under-lip was entirely gone, so that the teeth were distinctly seen. The animal was a male, and had a long mane on its neck.

"The skin was extremely thick and heavy, and as much of it remained as required the exertions of ten men to carry away, which they did with considerable difficulty. More than thirty pounds weight of the hair and bristles of this animal were gathered from the wet sand-bank, having been trampled into the mud by the white bears, while devouring the carcass. Some of the hair was presented to our Museum of Natural History, by M. Targe, censor in the Lyceum of Charlemagne. It consists of three distinct kinds. One of these is stiff black bristles, a foot or more in length; an-

other is thinner bristles, or coarse flexible hair of a reddish brown colour; and the third, is a coarse reddish brown wool, which grew among the roots of the long hair. These afford an undeniable proof, that this animal had belonged to a race of elephants inhabiting a cold region, with which we are now unacquainted, and by no means fitted to dwell in the torrid zone. It is also evident, that this enormous animal must have been frozen up by the ice at the moment of its death.

"Mr Adams, who bestowed the utmost care in collecting all the parts of the skeleton of this animal, proposes to publish an exact account of its osteology, which must be an exceedingly valuable present to the philosophical world. In the meantime, from the drawing I have now before me, I have every reason to believe, that the sockets of the teeth of this northern elephant, have the same proportional lengths with those of other fossil elephants, of which the entire skulls have been found in other places."

It is worthy of remark, that, although fossil bones of the elephant were described as such, in the middle of the sixteenth century, by Aldrovandus, it was not until two centuries afterwards that this opinion was credited. In the intermediate time, they were described as *lusus naturae*, bones of giants, *skeletons of fallen angels*, remains of marine animals, or of colossal baboons.—*Professor Jamieson's Notes to Cuvier's Theory of the Earth.*

THE APE TRIBE—APES—BABOONS—AND MONKEYS.

THE animals of this extensive tribe are usually arranged in three divisions, of Apes, Baboons, and Monkeys.—Apes are destitute of tails. They walk upright, and their hands and feet nearly resemble those of men. They are mild and gentle, and they imitate human actions more closely, and are susceptible of greater attainments, than any others of the same tribe.—Baboons have short tails, and generally walk on all fours. Some baboons are as tall as men, have long faces, sunken eyes, and are extremely disgusting in their appearance, and are, for the most part, sullen and ferocious.—Monkeys have tails, in general, longer than their bodies. They are lively, agile, full of frolic, chatter and grimace. From the structure of their members, they have many actions in common with the human kind. Most of them are fierce and untameable. Some are of a milder nature, and will show a degree of attachment; but, in general, they are endowed with mischievous intellects, and are therefore filthy, obscene, and lascivious. They inhabit the woods, and live on trees, feeding on fruits, leaves, and insects. In general they are gregarious, going in vast companies; but the different species never mix with each other, always keeping apart, and in different quarters. They leap with vast activity from tree to tree, even when loaded with their young, which cling to them. They are the prey of leopards, and others of the feline race,

and of serpents, which pursue them to the summits of the trees, and swallow them entire. They are not carnivorous, but, for mischief's sake, will rob the nests of birds of the eggs and young. In the countries where they most abound, the sagacity of the feathered tribe is more marvellously shown, in their contrivances to fix the nest beyond the reach of these invaders.

Monkeys generally live in extensive troops, and some naturalists have asserted that they form a sort of republic, in which a certain degree of discipline is kept up; that they always travel in order, conducted by chiefs, who are the most experienced animals of their troop. The negroes of Africa believe these animals to be a vagabond race of men, who are too indolent to construct habitations, or to cultivate the ground.

In many parts of India, says Mr Bingley, apes and monkeys are made objects of worship by the natives, and temples of the greatest magnificence are erected in honour of them. Their numbers are almost infinite. They frequently come in troops into the cities, and enter the houses at all times with perfect freedom. In Calicut, however, the inhabitants contrive to keep them out of their dwellings; but to effect this, they are compelled to have all their windows laticed. In Amadabad, the capital of Guzzerat, there are three hospitals for animals, where sick and lame monkeys are fed and cherished.

The Ourang-outangs on the banks of the Ganges, are larger and more mischievous than in any part of Africa. The negroes dread them, and cannot travel alone in the country without running the

hazard of being attacked by these animals, who often present them with a stick, and force them to fight. The Portuguese say, that they often hoist up young girls, from seven to twelve years old, into trees, who are wrested from them not without much difficulty. Most of the negroes imagine they are a foreign nation come to inhabit their country, who do not speak for fear of being compelled to work. When taken young, they are capable of being tamed, and taught to perform many menial offices. In Sierra Leone is a species so strong-limbed, and so industrious, that, when properly trained and fed, they work like servants. These generally walk on the two hind feet—pound any substances in a mortar—go to bring water from the river in small pitchers, which they carry full on their heads. But when they arrive at the door, if the pitchers are not soon taken off, they allow them to fall, and when they perceive the pitchers overturned and broken, they weep bitterly. They are taken with snares, taught to walk on their hind feet, and to use their fore feet as hands in performing different operations, as rincing glasses, carrying drink round to the company, turning a spit, &c.

Buffon saw an ourang-outang that was mild, affectionate, and good-natured. His air was melancholy, gait grave, movements measured, dispositions gentle, and very different from those of other apes. He had neither the impatience of the Barbary ape, the maliciousness of the baboon, nor the extravagance of the monkeys. It may be alleged that he had the benefit of instruction; but the other apes were educated similarly. Signs and words were alone sufficient to make him act; but

the baboon required a cudgel, and the other apes a whip, for not one of them would obey without blows. This animal would present his hand to conduct his visitors, and walk as gravely along with them as if he had formed a part of the company. He would sit down at table, unfold his towel, wipe his lips, use a spoon or a fork to carry the victuals to his mouth, pour his liquor into a glass, and make it touch that of the person who drank along with him. When invited to take tea, he brought a cup and a saucer, placed them on the table, put in sugar, poured out the tea, and allowed it to cool before he drank it. All these actions he performed without any other instigation than the signs or verbal orders of his master, and often of his own accord. He did no injury to any person; he even approached company with circumspection, and presented himself as if he wanted to be caressed. He lived one summer at Paris, and died in London the following winter.

M. de la Brosse, a French navigator, who was in Angola in the year 1718, and who purchased from a negro two ourang-outangs, remarks, that these animals would sit at table like men, and eat there every kind of food without distinction; that they would use a knife and fork, or spoon, to cut or lay hold of what was put on their plate; and that they drank wine and other liquors. At table, when they wanted any thing, they easily made themselves understood to the cabin-boy; and when the boy refused to answer their demands, they sometimes became enraged, caught him by the arm, bit and threw him down. The male was seized with sickness, and he made the people attend him as if he had been a human being. He was even bled

twice in the right arm; and whenever afterward he found himself in the same condition, he held out his arm to be bled, as if he knew that he had formerly received benefit from the operation.

Buffon describes a female ourang-outang, from the island of Borneo, which was brought alive into Holland in 1776, and lodged in the Menagerie of the Prince of Orange. She was extremely gentle and exhibited no symptoms whatever of fiercenes or malignity. She had a somewhat melancholy appearance, yet loved to be in company, and particularly with those persons to whose care she was intrusted. One morning she contrived to escape from her chain, and, soon afterwards, was seen ascending the beams and oblique rafters of the building, with wonderful agility. With some trouble she was retaken; but the efforts of four men were found necessary to secure her. Two of these seized her by the legs, and a third by the head whilst the other fastened the cord round the body. During the time she was at liberty, she had taken the cork from a bottle of Malaga wine, drank the wine to the last drop, and then set the bottle again in its place. She would eat of almost every kind of food that was given to her; but she lived chiefly on bread, roots, and fruit. Carrots and strawberries she was peculiarly fond of, as well as of several kinds of aromatic plants, and of the leaves and root of parsley. She also ate meat, both boiled and roasted, as well as fish; and was fond of eggs the shells of which she broke with her teeth, and then emptied by sucking out the contents. When strawberries were given to her on a plate, it was amusing to see her take them up, one by one, with a fork, and put them into her mouth, holding at

the same time the plate in the other hand. Her usual drink was water; but she would also eagerly drink all sorts of wines, particularly Malaga. After drinking, she wiped her lips; and after eating, if presented with a toothpick, she would use it in a proper manner. One day, seeing the padlock of her chain opened with a key, and shut again, she seized a little bit of stick, and put it into the key-hole, turning it about in all directions, examining to ascertain whether the padlock would not open.—*Shaw's Nature Displayed.*

ANTS—THEIR HABITS AND PECULIARITIES.

All the species of ants are gregarious, and, like the bees, consist of male, female, and neuter. The neuters, exempted from every sexual function, exercise all the other offices necessary for the existence and welfare of the community; they collect supplies of food, explore the country, and seize upon every animal substance, whether living or dead, which they transport to their nest. They construct every part of their dwelling, hatch the eggs, feed and remove the larvæ, as occasion may require, to different situations favourable to their growth and development. Both as aggressors and defenders, they fight all the battles of the commonwealth, and provide safety for their weaker and more passive companions—thus acting the part of slaves in these singular republics. Yet, probably, this anomaly of sex is more apparent than real; and, however different in external conforma-

tion to the productive females, they essentially be long to the same sex.

Ants seem endowed with more muscular strengt than any other insect of their size. Of this w have proofs in their movements, the toil man undergo, the great loads they carry (often ten o twelve times their own weight), and their agilit in escaping danger. This high irritability is joine with corresponding power of sensation, manifeste in their susceptibility to impressions capable of a fecting the organs of sense. They quickly pe ceive all changes of temperature of the atmo sphere ; and are readily and disagreeably affecte by moisture. In the perfection of sight, they seer nearly on a level with other insects. The male and females are provided with both the composit and simple eyes. The labouring ants are frequent ly destitute of the latter, which confirms the sus picion, that the simple eyes are chiefly instrumen tal in the vision of distant objects.

Ants possess acute smell, useful in directin them to their food, and also in enabling them t follow, by the scent, the track of their compa nions. If the end of the finger be passed twic or thrice across the line of their march, so as t brush off the odorous particles with which the ant already may have impregnated the track, thos who follow immediately stop on arriving at th place of the experiment, and afterwards direct thei course irregularly, till they have passed over it when they soon find the path, and proceed wit the same confidence as before. Latreille, to dis cover the seat of smell, long suspected to resid in the antennæ, deprived several labouring ants o these organs, and replaced them near their nests

When thus mutilated, they wandered to and fro in all directions, as if delirious, and unconscious whither they were going. Some companions were seen to notice their distress, and approaching them with apparent compassion, applied their tongues to the wounds of the sufferers, and anointed them with a liquor from their own mouths.

With regard to their food, very erroneous opinions were prevalent, being often supposed to consume corn, and greatly injure plants, by devouring their roots or stems; but they are chiefly carnivorous, preying indiscriminately on all the softer parts, and especially the viscera, of animals. These, indeed, they will often attack when alive, and overpower by dint of numbers; either devouring their victim on the spot, or dragging it a prisoner into the interior of the nest. If, however, the same be too bulky for easy removal, they make a plentiful meal, and exert, like the bee, a power of disgorging a portion, and of imparting it to their companions at home; and they are able to retain at pleasure the nutritious juices unchanged for a considerable time. They with rapidity consume and anatomize the carcass of any small bird or quadruped that falls in their way; and an easy method of obtaining such natural skeletons is, by placing the dead bodies in the vicinity of a populous ant-hill.

In hot climates, where they multiply amazingly, their voracity and boldness increase with their numbers. Bosman states, that, in one night, they will devour a sheep, leaving it a fine skeleton; while a fowl is only the amusement of an hour. They will attack even living animals of a considerable size; rats and mice often become their vic-

tims. The sugar ants of Grenada cleared every plantation of rats and other vermin, probably by attacking their young. Poultry, or other small stock, were not raised without great difficulty; and the eyes, nose, and other emunctories of dying or dead animals, were instantly covered. They generally attack the most sensible parts, which have the finest cuticle, and, accumulating about the nostrils, destroy the animal by interrupting respiration. Negroes with sores have great difficulty in keeping the ants from assailing them. Their power of destruction keeping pace with their increase, it is not easy to assign limits to either; and their united hosts are often formidable. Prévost states, that an Italian missionary, resident in Congo, was awakened by his negroes, greatly alarmed at the house being invaded by an immense army of ants, rushing in like a torrent; and, before he could rise, they had mounted upon his legs. Upon the floor and passages, they formed a stratum of considerable depth. Fire only was capable of arresting their progress. Cows have been devoured in their stalls by these daring devastators. Smith reports, that at Cape Corse, the castle was attacked by legions of ants, preceded by thirty or forty acting as guides. At daybreak they made this incursion, entering first by a chapel, on the floor of which some negro servants were lying, who, assailed by this enemy, fled with precipitation, and alarmed their master, who could hardly recover from his astonishment at beholding the advancing multitude, extended a quarter of a mile before him. There was little time for deliberation; and a desperate expedient was adopted of putting a long train of gunpowder across the

ine of their march, extending it to their flanks, vhich had already began to deploy, and, setting ire to the whole, millions were destroyed at one ›low, which so intimidated the rest, that the whole ırmy retreated in disorder.

Mr Campbell, in South Africa, observed in the listrict of Albany, at the Cape, an ant-hill five eet high, and twelve in circumference; and in the orests of Guiana, they actually are from fifteen to wenty feet high; and, viewed from a distance on hese widely extended savannahs, they resemble he rude huts of savages; but they contain a race nore ferocious than the savage, or the tiger himelf, and cannot be approached by man without he utmost danger of being devoured. When new ettlers, in clearing the country, meet with any of hese, they immediately desist from their task, and ften abandon the neighbourhood, unless they can peedily destroy this enemy in his citadels, whence e is able to pour forth an overwhelming number f combatants. The only method of accomplishng this, is digging a trench all round the ant-hills, lling it with dry wood, and setting fire to it on very side, by lighting it quickly in different places; hus cutting off all retreat to the ants,—then to batter down the edifice. The ants thus scattered oon perish.

In building their nests, each species of ant fols its own peculiar mode of construction, and mploys different materials. Many, particularly he smaller species, form them of clay; one set uilding a regular series of apartments in successive tories, with materials furnished by another set of vorkers, who are excavating the ground below.

The ceilings are supported by small pillars in some parts, and by vertical walls in others, while broad arches are in other places raised, to protect large spaces, and admit of lengthened passages of communication, through a long extent of apartments. These ants proceed in building only when the earth is softened by rain or dew, and the atmosphere sufficiently moist, to allow of the materials cohering firmly before they dry. On one occasion, when the ants, under the inspection of Mr Huber, had discontinued their labours, on account of a too dry atmosphere, he got them to renew their operations by sprinkling water upon them with a wet brush in imitation of a natural shower. They carefully close their habitations at night, to prevent the intrusion of other insects; and a few remain outside as sentinels, to give alarm in case of danger. Some species collect fragments of leaves, bark, or straw with which they construct more permanent and artificially constructed nests. Others employ only the fine powder from decayed wood. Some, for greater security, establish themselves under a large stone, or in the crevices of decayed buildings. Several tribes, on the other hand, penetrate the solid substance of wood, which they scoop out into numerous cells, leaving only intermediate partitions of extreme tenuity, just sufficiently strong to enable the whole fabric to support itself, while it crumbles into powder when pressed between the fingers.

Very different degrees of sagacity belong to different tribes of ants. Some tribes are peculiarly fond of the honey which exudes from the aphis, convey many of these insects into their own nests, lodge them near the vegetables on which they feed,

but keep them prisoners within their habitations, and assign them distinct apartments in the subterraneous recesses of their dwellings. Conscious of the future advantages derivable from these insects, they collect their eggs, and superintend their hatching with the same care as that they bestow on those of their own species. The aphis lives in perfect harmony with its keepers, who, so far from molesting, defends them courageously against ants from other nests, who frequently attempt to seize on them. Occasionally the ants lodge them in fortified buildings, distant from the rest, in situations most secure from invasion. Not only the aphis furnishes this kind of provision to the ant, but the kermes and gall-insect are occasionally employed for the same purpose, and are found domesticated in ant-nests, at the same time that they contain several species of aphis, from all of which they collect nutriment; and the whole of this system seems analogous in economy with the use which men make of the cow, and even of the very same insect. Like nations, too, they display equal ferocity in the contentions occasionally exhibited between the inhabitants of neighbouring nests, nature appearing to have instilled, together with the love of social order, the same passions of rivalry, ambition and revenge, whose influence is deplored among the human species. War, the scourge of man, exerts its desolating power among the tribes of gregarious insects, and checks their otherwise excessive increase. The battles between rival colonies of ants are often of prodigious magnitude, —millions of combatants engage with a fury and pertinacity truly astonishing. Their weapons of offence are the jaws, capable of inflicting a deep

bite, and of instilling into the wound a highly acrid liquor; and also, in many species, a sting in situation and structure like that of a bee, and likewise containing a venomous juice, possessing acid properties, and, though long supposed by chemists to contain a peculiar acid, denominated the *formic*, has been satisfactorily shown by Fourcroy and Vauquelin, to consist of the ascetic and malic acids, combined with a portion of acid animal matter, to which it owes its peculiar taste and smell. It is extremely volatile and pungent, and the ant, when irritated, is capable of throwing it out in considerable quantities.

Some of the most daring and courageous species, the *Amazon-ant*, make it the business of their lives to attack the nests of the weaker species, and, after a desperate conflict, plunder them of their eggs and larva, which they convey to their own nests. These are hatched and reared by ants of the same species as themselves, considered as auxiliaries to the amazons, who had at some former period kidnapped them from their parent nest. Thus, a society is formed among different species of insects, to which a parallel exists only in the human race. The amazons live without labour. By the ants procured by this kind of slave-trade, they are attended, fed, and cherished, and equal care taken of their offspring, as of those of their own species. Perfect order is preserved, and the natural instinct of hostility, which, in another condition of the society, exists between the two tribes, seems in the auxiliaries completely extinguished, by their being educated with the race of their original oppressors.

Ants have numerous enemies among quadru-

peds and birds; and some, as the ant-eater, *dasypus*, and *manis*, or *pangolin*, together with the tribe of woodpeckers, devour a very large proportion. The *formica leonis*, or lion-ant, feeds chiefly on these insects. The bees at the Cape frequently drive the ants from their nests, and take possession themselves. Ants are also infested by lice, so minute as to be invisible without the assistance of a very high magnifying power, but resembling in power those of the fowl and the dove.

A gentleman of Cambridge, says Mr Bingley, one day remarked an ant dragging along what, with respect to its strength, might have been denominated a piece of timber. Others were severally employed, each in its own way. Presently, this little creature came to an ascent, where the weight of the wood seemed for a while to overpower him. He did not remain long perplexed with it; for, three or four others, observing his dilemma, came behind and pushed it up. As soon, however, as he had got it on level ground, they left it to his care, and went to their own work. The piece he was drawing happened to be considerably thicker at one end than the other. This soon threw the poor fellow into a fresh difficulty; he unluckily dragged it between two bits of wood. After several fruitless efforts, finding it would not go through, he adopted the only mode that a reasoning being, in similar circumstances, could have taken; he came behind it, pulled it back again, and turned it on its edge, when, running again to the other end, it passed through without difficulty. The same gentleman, sitting one day in the garden of his college, he was surprised by remarking

a single ant, busily employed in some work that caused him to make many journeys, to and from the same place. This gentleman traced him to the entrance of the habitation of a community, whence he observed him to take the dead body of an ant in his fangs, and run away with it. He carried it to a certain distance, dropped it, and returned for another, which, by the time of his arrival, was brought to the same hole.

Dr. Franklin, believing that these little creatures had some means of communicating their thoughts or desires to one another, tried several experiments with them, all of which tended to confirm his opinion, especially the following. He put a little earthen pot, containing some treacle, into a closet, where a number of ants collected, and devoured the treacle very quickly. But, on observing this, he shook them out, and tied the pot with a string to a nail, which he had fastened into the ceiling; so that it hung down by the string. A single ant, by chance, remained in the pot. This ant ate till it was satisfied; but, when it wanted to get off, it could not for some time find a way out. It ran about the bottom of the pot, but in vain; at last, after many attempts, it found the way to the ceiling, by going along the string. After it was come there, it ran to the wall, and thence to the ground. It had scarcely been away half an hour, when a great swarm of ants came out, got up to the ceiling, and crept along the string into the pot, and began to eat again. This they continued to do until the treacle was devoured; in the meantime, one swarm running down the string, and the other up.

Swammadam informs us, that, notwithstanding

the smallness of ants, nothing hinders our preferring them to the largest animals, if we consider either their unwearied diligence, wonderful powers, or inimitable propensity to labour. Their amazing love to their young is even more unparalleled among the larger classes. They not only daily carry them to such places as may afford them food; but if, by accident, they are killed, or even cut into pieces, they will, with the utmost tenderness, carry them away piecemeal in their arms.—*Shaw's Nature Displayed.*

LOCUSTS—THEIR NUMBERS AND DEVASTATIONS.

THE annals of most warm countries record devastations produced by locusts, which sometimes appear in clouds of vast extent. They seldom visit Europe in such swarms as formerly; yet in the warmer parts are still formidable. Those which have at uncertain intervals visited Europe, are supposed to have come from Africa. They are a large species, about three inches long; the head and horns brownish, blue about the mouth, and the inside of the larger legs, the shield on the back greenish, the upper side of the body brown, spotted black, and the under side purple, the upper wings brown, with small dusky spots, and one large spot at the tips; the under wings transparent, of a light-brownish green, and a dark cloud of spots near the tips. These insects are bred in the warm parts of Asia and Africa, whence they have often taken flight into Europe, and committed great devastations. They multiply quicker than any other

animals, and are truly terrible where they breed. Some were seen in different parts of Britain in 1748, and great mischief was apprehended; but happily, our cold climate and humid soil are very unfavourable to their production, so that, being only animals of a year's continuance, they all perished, without leaving a young generation to succeed them. When the locusts take the field, they seem to have a leader, whose flight they observe, and strictly regard all his motions. At a distance they appear like a black cloud, which, as it approaches, gathers upon the horizon, and almost hides the light of day. Sometimes the husbandman sees this imminent calamity pass over without injuring him, and the whole swarm proceeds onward to some less fortunate country. However, where they alight they destroy every green thing, strip the trees of their leaves, and devour the corn and grass. In the tropical climates, they are less pernicious than in the southern parts of Europe, as, in the first, the power of vegetation is so strong, that an interval of three or four days repairs the damage; but, in Europe, this cannot be done till next year. Besides, in their long flights hither, they are famished by the journey, and are, therefore, more voracious wherever they settle; and as much damage is occasioned by what they destroy as by what they devour. Their bite contaminates the plant, and either destroys, or greatly weakens its vegetation. The husbandmen say, they burn wherever they touch, and leave marks of their devastation for three or four years ensuing. When dead they infect the air, so that the stench is insupportable. In the year of the world 3800, Africa was infested with a multitude of locusts.

After eating up every thing green, they flew off, and were drowned in the sea; where the stench could not have been equalled by the putrifying carcasses of 100,000 men.

In 1650, a cloud of locusts entered Russia in three different places; from whence they spread over Poland and Lithuania in such astonishing multitudes, that the air was darkened, and the earth covered with their numbers. In some places they lay dead to the depth of four feet; in others, they covered the surface like a black cloth; the trees bent with their weight, and the damage the country sustained exceeded computation.

In Barbary, their numbers are formidable. Dr Shaw witnessed their devastations in 1724. Their first appearance was in March; the wind had been southward some time. In April, their numbers were so increased, that, in the heat of the day, they formed large swarms like clouds, and darkened the sun. In the middle of May, they began to retire into the plains to deposite their eggs. In June, the young brood began to appear, forming many compact bodies of several hundred yards square, which afterwards marching forward, climbed the trees, walls, and houses, eating every thing green in their way. The inhabitants, to stop their progress, cut trenches all over their fields and gardens, which they filled with water. Some placed large quantities of heath, stubble, and other combustible matter, in rows, and set them on fire on the approach of the locusts, but all to no purpose; the trenches were quickly filled, and the fires put out, by the innumerable swarms that succeeded each other. A day or two after one of these motions, others, just hatched, came to glean,

gnawing off the young branches, and the very bark of the trees. Having lived thus near a month they arrived at their full growth, and threw off their worm-like state, by casting their skins. Preparatory to this change, they fixed their hinder part to some bush, or twig, or corner of a stone and immediately, by an undulating motion, their heads would appear first, and soon after their bodies. The whole transformation was performed in seven or eight minutes, after which they remained a little while in a languishing condition; but, as soon as the sun and air had hardened their wings and dried up the moisture left on casting their sloughs, they resumed their former greediness with addition of both strength and agility. They did not, however, continue long in this state before they were entirely dispersed. After laying their eggs, they directed their course northward and probably perished in the sea. In Barbary however, the fertility of soil, and warmth of climate, generally render their depredations of little consequence; besides that, many circumstances concur to diminish their number. They are naturally herbivorous; they often fight, and the victor devours the vanquished. They are the prey too, of serpents, lizards, frogs, and the carnivorous birds; they have been found in the stomachs of the eagle, and different kinds of owls; and they are used as food by the Moors, who hunt them, fry them in oil or butter, and sell them publicly at Tunis and other places.

The locust spends April, May, and June in the place of its birth. At the end of June, its body is strong, and its wings have a fine rose colour. Being then in their prime, they assemble, for the

last time, to propagate their species. The morning is spent in the courtship of the one, and the retreat of the other. When the warmth has cleared their wings from the dampness of the night, the males continue their pursuit, and rise with the females 500 feet high, forming a black cloud that darkens the solar rays. The clear atmosphere of Spain becomes gloomy, and the finest summer day of Estremadura more dismal than the winter of Holland. The rustling of so many millions of wings in the air, resembles the trees of a forest agitated by the wind. The first direction of this formidable column is always against it, which, if not too strong, the column will sometimes extend above two leagues. The locusts then make a halt, when the most dreadful havoc begins. Their sense of smell being so delicate, they can find, at that distance, a corn field or a garden; and after demolishing it, they rise again in pursuit of another. This may be said to be done in an instant. Each seems to have four arms and two feet. The males climb up the plants, as sailors ascend the shrouds of a ship, and nip off the tenderest buds, which fall to the females below.—*Shaw's Nature Displayed.*

PLAGUE OF INSECTS IN IRELAND IN 1688.

According to the best account I can get of the vast swarms of insects which of late years have much infested this kingdom of Ireland, I find that this flying army was first taken notice of in the year 1688. They appeared on the south-west coast of Galway, brought thither by a south-west wind, one of the common, I might almost say,

tradewinds, of this country. From hence they made their way into the more inland parts, towards Hedford, a place belonging to Sir George St George, Bart., about twelve miles north from the town of Galway. Here, and in the adjacent country, multitudes of them showed themselves among the trees and hedges in the daytime, hanging by the boughs, thousands together in clusters, sticking to the back one of another, as is the manner of bees when they swarm. In this posture, or lying still and covered under the leaves of the trees, or clinging to the branches, they continued quiet with little or no motion during the heat of the sun. But towards evening or sunset, they would all arise, disperse, and fly about, with a strange humming noise, much like the beating of drums at some distance, and in such vast incredible numbers, that they darkened the air for the space of two or three miles square. Those that were travelling on the roads, or abroad in the fields, found it very uneasy to make their way through them, they would so beat and knock themselves against their faces in their flight, and with such a force as to smart the place where they hit, and leave a slight mark behind them.

A short while after their coming, they had so entirely eat up and destroyed all the leaves of the trees for some miles round about, that the whole country, though it was in the middle of summer, was left as bare and naked as if it had been in the middle of winter; and the grinding of the leaves in the mouths of this vast multitude, altogether made a sound very much resembling the sawing of timber. They came also into the gardens, and destroyed the buds, blossoms, and leaves of all the

fruit-trees, that they were left perfectly naked; nay, many of them that were more delicate and tender than the rest, lost their sap as well as leaves, and quite withered away, so as they never recovered it again, particularly several trees in the curious plantation of one Mr Martin. Nay, their multitudes spread so exceedingly, that they got into the houses, where numbers of them crawling about, were very irksome; and they would often drop on the meat as it was dressing in the kitchen, and frequently fall from the ceiling of the rooms into the dishes as they stood on the table while they eat—so extremely offensive and loathsome were they.

Their numerous creeping spawn, which they had lodged under ground next the upper sod of the earth, did yet more harm in that close retirement, than all the flying swarms of their parents had done abroad; for this young destructive brood, lying under ground, fell a devouring the roots of the corn and grass, and, eating them up, ruined both the support of man and beast. This spawn, when first it gave sign of life, appeared like a large maggot, and by taking food, and increasing every day, became a bigger worm, till at length it grew as big as a great white caterpillar; from whence, according to the usual transformation natural to these smaller animals, came forth this our flying insect.

The rage of this plague of vermin was fortunately checked several days. High winds, wet and misling weather, destroyed many millions of them in one day's time. Whence I gather, that though we have them in these southern moist cli-

mates, they are more natural, and more peculiarly belonging to warm and dry countries. Whenever these ill constitutions of the air prevailed, their bodies were so enfeebled they would let go their holds, and drop to the ground from the branches where they stuck; and so little a fall as this, at this time, was of sufficient force quite to disable, and sometimes perfectly kill them. Nay it was observable, that even when they were most agile and vigorous, a slight blow or offence would for some time hinder their motion, if not deprive them of life. During these unfavourable seasons of weather, the swine and poultry of the country watched under the trees for their falling, and eat them up in abundance, being much pleased with the food, and thriving well upon the diet. Nay I have been assured, that the poorer sort of the native Irish (the country then labouring under a scarcity of provision), had a way of dressing them, and lived upon them as food.

In a little time it was found, that smoke was very offensive to these flies, and by burning heath, fern, and such like weeds, in this or that corner of their gardens or orchards which lay most convenient for the wind to disperse it among the trees, they would secure their gardens, and prevent their incursions; or, if they had entered, drive them out again.—*Phil. Trans.*

CURIOUS BEETLE.

In the middle of the month of June 1737, while

Mr Baker * was at a relation's house at Tottenham, in the county of Middlesex, a large cistern of lead, that was placed in the coach-house yard, to receive by pipes the rain-water from some outbuildings, fell down. Curiosity led him to examine into this cistern, and at the bottom he observed several black beetles plunging in a muddy slimy sediment which the water had left. Taking out two or three of them, he found them of a middling size, somewhat above an inch in length, having six pretty long legs, with two little hooks at the extremity of each, in the manner of the common beetles. They were all over of a rusty black colour, with antennæ long and jointed; a body covered with one strong shell, forming an appearance of case-wings, but undivided, and without any filmy wings underneath, and a tail turning up a little; in short, they resembled very much a sort of beetle that is sometimes seen in houses, but were of a stronger and much more firm contexture.

As Mr Baker had preserved most of our English insects, he chose one of the largest of these beetles, and threw it into a cup full of common lamp spirits, that being the way of killing them and preparing them for his purpose, and in a few minutes it appeared to be quite dead. He then

* Mr Henry Baker, F. R. S., was a learned antiquary and naturalist, on which subjects he communicated a great number of curious papers to the Royal Society, which were published in the Philosophical Transactions in the several volumes, from the 41st to the 56th; as well as some ingenious separate works, as, the Microscope made Easy, in 8vo, 1742; and Employment for the Microscope, 8vo, 1764.

shut it up in a round pill-box, of about an inch and half diameter, and carried it in his pocket next day to London, where he tossed it into a drawer, and thought no more of it for about two months after; when, opening the box, he found it alive and vigorous; though it had nothing to eat for all that time, nor received any more air than what could be met with in so small a box, the cover of which shut very close. Having, however, no intention of keeping it alive, he again plunged it into spirit of wine, and let it lie considerably longer than the first time, till, supposing it dead beyond all possibility of recovery, he put it into the box, and locked it in a drawer, without looking any more at it for a month at least, when he found it again alive. And now he began to imagine there must be somewhat extraordinary in this creature, since it could survive the force of spirit of wine, which soon kills most other insects, and live for three months, without taking in any sustenance.

A few days before this, a friend had sent Mr Baker three or four cock-roaches, or, as Merian calls them, *kakkerlacae*, brought alive from the West Indies. These he had placed under a large glass of six or seven inches diameter, made on purpose to observe the transformation of caterpillars. He put the beetle among them, that it might enjoy a greater share of liberty than it had done for three months before. He fed them with green ginger, moistened in water, and they ate it greedily; but he could not find, nor does he believe, that the beetle ever tasted it during the whole five weeks they lived under the glass together. He often took notice that the cock-roaches would avoid the beetle, and seem frightened at its ap-

proach; but never observed any tokens of its liking or dislike of them; for he usually stalked along, without regarding whether they came in his way or not. Perceiving the cock-roaches began to decline in vigour, Mr Baker was afraid they would lose much of their beauty, if he permitted them to die of sickness, and would become unfit to be preserved; he therefore put them into spirits of wine, and the beetle their companion with them. They appeared dead in a few minutes, and he believed were really so; the beetle seemed likewise in the same condition. After they had lain in the spirits about an hour, he took them out, and whelmed the glass over them, till he should have leisure to dispose of them as he intended. This was about ten o'clock in the morning, and he saw them no more till evening, but found the beetle then creeping about as strong and vigorous as ever; and therefore he resolved to put him to a trial he could not possibly survive, which was to let him remain a whole night in spirits. But here, too, Mr Baker found himself mistaken; for after he had been taken out a day, he appeared as lively as if nothing had happened to him. After that time, Mr Baker put him no more in spirits, but kept him under the glass aforementioned, where it was still living after two years and a half; and Mr Baker has never been able to discover that he had drank or eaten any thing. However, by way of experiment, Mr Baker put under his glass, at different times, water, bread, fruits, &c.; but he never found them in the least diminished, or touched by the beetle. These trials, too, were always made at many months asunder; and he is pret-

ty certain there has been at least a year together, during some part of the aforesaid time, in which nothing has been offered him either to eat or drink.

The question will then be, how this creature has been wonderfully kept alive for two years and a half, without taking any visible food? The supposition that it finds its nourishment in the air, carries with it the highest probability; since there are particles in the air which evidently supply a growth to plants of some particular kinds, such as the sempervive, orpine, house-leek, &c. And the same, or some other particles in it, may possibly be likewise able to afford a nourishment to animals of some certain kinds. There is a further reason also to believe, that something like this must be the case; for, in the amazing plan of nature, the animal, vegetable, and mineral kingdoms, are not separated from each other by wide distances, or broken off by sudden starts, but differ from each other, near their boundaries, by such minute and insensible degrees, that it is impossible to find out certainly where the one begins, or where the other ends. As the air, therefore, yields nourishment to some kinds of plants, it may probably do the same to some kinds of animals, for otherwise a link would seem wanting in the mighty chain of beings: And that cameleons, snakes, and lizards, can live for months together without any visible sustenance, is a fact generally allowed to be true; the cause of it, too, has been attributed to an exceedingly slow digestive circulation, and distribution of nourishment in those creatures: But as their agility seems to imply a brisk motion of their animal spirits, Mr Baker

thinks the circulation of their other fluids cannot be so slow as is commonly supposed; and perhaps it may not be unreasonable to believe, that their being able to live so long without visible food, is rather owing to some other nourishment they receive from the air, which supplies the want of more substantial diet.

This beetle walked not much about under the glass that covered it, but was usually found with its nose thrust close down to the bottom, perhaps to suck in air. On removing the glass, it appeared robust and vigorous, and would willingly run away. A strong aromatic kind of smell issued from it, agreeable enough when there is not too much of it, and the same scent hangs about the fingers a long while after touching it. In the exhausted receiver, where it was kept sometimes for half an hour, it seemed perfectly unconcerned, walking about *in vacuo* as briskly as in the open air; but on admission of the air, it shrinked its legs together, and appeared in a surprise for near a minute.

This beetle, after being kept half a year longer, was permitted to get away by the carelessness of a servant, who took down the glass to wipe it.—*Phil. Trans. vol. viii.*

SPIDERS AND THEIR WEBS.

The spiders of this country manufacture nets of various forms, adapted to various situations, to arrest the flies that are their food; and some of them have a house or lodging-place in the middle of the

net, well contrived for warmth, security, or concealment. There is a large spider in South America, who constructs nets of so strong a texture, as to entangle small birds, particularly the hummingbird; and in Jamaica there is another spider, who digs a hole in the earth obliquely downwards, about three inches in length, and one inch in diameter. This cavity she lines with a tough thick web, which, when taken out, resembles a leathern purse; but what is most curious, this house has a door with hinges, like the operculum of some seashells; and herself and family, who tenant this nest, open and shut the door whenever they pass or repass. This history was told me, and the nest, with its operculum, shown me by the late Dr Butt of Bath, who was some years physician in Jamaica. The production of these nets is indeed a part of the nature or conformation of the animal, and their natural use is to supply the place of wings, when she wishes to remove to another situation. But when she employs them to entangle her prey, there are marks of evident design, for she adapts the form of each net to its situation, and strengthens those lines that require it, by joining others to the middle of them, and attaching those others to distant objects, with the same individual art that is used by mankind, in supporting the masts and extending the sails of ships. This work is executed with more mathematical exactness and ingenuity by the field-spiders, than by those in our houses, as their constructions are more subjected to the injuries of dews and tempests.

Besides the ingenuity shown by these little creatures in taking their prey, the circumstance of their counterfeiting death, when they are put into ter-

ror, is truly wonderful; and as soon as the object of terror is removed, they recover and run away. Some beetles are also said to possess this piece of hypocrisy.

The curious webs or cords, constructed by some young caterpillars to defend themselves from cold, or from insects of prey, and by silk-worms, and some other caterpillars, when they transmigrate into aureliæ or larvæ, have deservedly excited the admiration of the inquisitive. But our ignorance of their manner of life, and even of the number of their senses, totally precludes us from understanding the means by which they acquire this knowledge.—*Dr Darwin's Zoonomia.*

REMARKABLE SPECIES OF LEECH.

THERE is an extraordinary *Sanguisuga*, or Leech, found sometimes sticking fast in the fish called Xiphias, or Sword Fish. S. Boccone gives it the name of *Hirudo*, or *Acus cauda utrinque pennata*, because of its working itself into the flesh, and sucking the blood of the said fish. He describes it to be of about four inches long, the belly of it white, cartilaginous and transparent, without eyes or head, (that he could observe); but, instead of a head, it had a hollow snout, encompassed with a very hard membrane, differing in colour and substance from the belly; which snout it thrusts whole into the body of the fish, as strongly as an *augre* is wound into a piece of wood, and fills it full into the very orifice. It hath a tail shaped like a feather, serving for its motion, and under it

two filaments, or slender fibres, longer than the whole insect, whereby, it seems, it clings about stones or herbs, and sticks the closer in the body of the sword-fish, of which it attacks those parts only where the fins of the fish cannot touch or trouble it, the observer affirming that he has often found it sticking in the back, and in the belly, and sometimes close to the head, sometimes close to the tail of that fish, but always far enough from the fins. Within its belly he noted some vessels like small guts, reaching from one end of it to the other, which, by the pressure of his nail, he made reach to the orifice of the snout, whence they retired back of themselves to their natural situation; they seeming to be the instruments for sucking the blood, because the snout is in itself an empty part, destitute of fibres and valves, to draw and suck with; whereas these vessels having a motion resembling that of a pump, in which the snout of this animal serves for a sucker, drawing the blood from one end to the other. And the belly of this insect being framed ringwise, the structure serves to thrust the said inner vessels into the orifice of the trunk, and to draw them back again.

This creature, as it torments the sword-fish so it is, by our observer's relation, vexed itself by another insect, which he calls a Louse, of an ash colour, fastened toward the tail of this leech as firmly as a snail is to a rock. It is of the bignes of a pea, and hath an opening, whence came out many small winding and hairy threads. It hath not been observed (as far as our author could learn) to trouble, or to be on any other animal than this leech.—*Phil. Trans.*

THE CHAMELEON.

THE chameleon of the Concan, including the tail, is about nine inches long; the body only half that length, varying in circumference as it is more or less inflated; the head, like that of a fish, is immoveably fixed to the shoulders; but every inconvenience is removed by the structure of the eyes, which, like spheres rolling on an invisible axis, are placed in invisible cavities, projecting from the head. Through a small perforation in the exterior convexity, appears a bright pupil, surrounded by a yellow iris, which, by the singular formation and motion of the eye, enables the animal to see what passes before, behind, or on either side; and it can give one eye all these motions, while the other remains perfectly still. A hard rising protects these delicate organs; another extends from the forehead to the nostrils. The mouth is large and furnished with teeth, with a tongue half the length of the body, and hollow like an elephant's trunk; it darts nimbly at flies and other insects, which it seems to prefer to the aërial food generally supposed to be its sustenance. The legs are longer than usual in the *lacerta genus*. On the fore-feet are three toes nearest the body, and two without; the hinder exactly the reverse. With these claws it clings fast to the branches, to which it sometimes entwines itself by the tail, and remains suspended. The skin is granulated like shagreen, except a range of hard excrescences, or denticulations, on the ridge of the back, which are always of the same colour

as the body; whereas a row of similar projections beneath continue perfectly white, notwithstanding any metamorphosis of the animal.

The general colour of the chameleon, so long in my possession, was a pleasant green, spotted with pale blue. From this it changed to a bright yellow, dark olive, and a dull green: but never appeared to such advantage as when irritated, or a dog approached it; the body was then considerably inflated, and the skin clouded like tortoise-shell, in shades of yellow, orange, green, and black. A black object always caused an almost instantaneous transformation. The room appropriated for its accommodation, was skirted by a board painted black. This the chameleon carefully avoided; but if he accidentally drew near it, or we placed a black hat in his way, he was reduced to a hideous skeleton, and from the most lively tints, became black as jet. On removing the cause, the effect as suddenly ceased; the sable hue was succeeded by a brilliant colouring, and the body was again inflated.—*Forbes's Oriental Memoirs.*

STRENGTH OF THE PRINCIPLE OF VITALITY AND POWER OF REPRODUCTION IN WORMS, AND SOME KINDS OF SHELL-FISH.

REPRODUCTION means, the restoration of a thing before existing, but destroyed. It is well known that trees and plants may be raised from slips and cuttings; and observations have shown that some animals have the same property. The polype was the first instance; but we had scarce time to

wonder at the discoveries Trembley had made, when Bonnet discovered the same property in a species of water-worm.

It deserves inquiry, whether this reproduction will take place in whatever part the worm is cut? Bonnet tried many experiments on the water-worms which have this property. These are, at their common growth, from two to three inches long, and of a brownish colour, with a cast of reddish. From one of these worms he cut off the head and tail, taking from each extremity only a 12th of an inch, but neither piece was able to reproduce what was wanting: they both perished in about twenty-four hours; the tail first, and then the head. The body still lived as well as before, and seemed to suffer nothing by the loss, the head part being immediately used as if the head was thereon, boring the creature's way into the mud. In two other points, also, the reproduction will not take place. One is about the fifth or sixth ring from the head, and the other at the same distance from the tail, and probably owing to the condition of the great artery in these parts.

The want of the reproductive power, relates only to the head and the tail-ends; for the body feels little inconvenience from the loss, and speedily reproduces those parts. Where, then, is the principle of life in such worms, which, after their heads are cut off, have not only the same motions, but even the inclinations they had before? And this difficulty is very small, compared to some others which offer themselves. Is this wonderful reproduction of parts, only a natural consequence of the laws of motion? or is there lodged in the body of

the creature, a chain of minute buds or shoots, a sort of little embryos, already formed and placed where the reproductions are to begin? Are these worms mere machines? or are they, like more perfect animals, a sort of compound, whose springs of motion are actuated or regulated by a sort of mind? And if themselves have such a principle, how is this principle multiplied, and found in every separate piece? Is it to be granted, that there are in these worms not a single mind, (if it be so called), but that each contains as many as there are pieces capable of reproducing perfect animals? Are we to believe, with Malpighi, that these worms are all heart and brain, from one end to the other? This may be; but, even if we knew this, we should know in reality very little more by knowing it.

The nice sense of feeling in spiders, has been mentioned by naturalists; but these worms have something more surprising in regard to this particular. When a piece of any substance is brought near them, they do not wait for its touching them, but leap and frisk about as soon as it approaches them. The experiments have not ascertained whether this is really owing to feeling or sight; for, though without visible organs of sight, yet they seem affected by the light of the sun, or a candle, and always frisk about when exposed to either; and even the moonlight has some effect upon them.

A twig of willow, poplar, or many other trees, being planted in the earth, takes root, and becomes a tree, whose every piece will, in the same manner, produce other trees. So will these worms; they are cut into pieces, which become perfect animals, which may be again cut into pieces, each

of which will, in the same manner, produce an animal. Some have supposed that these worms were oviparous; but Bonnet, on cutting one of them to pieces, having observed a slender substance, resembling a small filament, to move at the end of one of the pieces, separated it, and, on examination, it proved to be a perfect worm, of the same form with its parent, which lived and grew larger in a vessel of water into which he put it. These small bodies are easily divided, and readily complete themselves again; a day serving for the reproduction of a head, and the small and slender worms sooner complete themselves. The bodies of the large worms, attentively examined by the microscope, exhibit the young worms alive, and moving about within them. The ramifications of the great artery, have much the appearance of young worms, and have a sort of continual motion by the systole and diastole of the several portions of the artery, which serve as so many hearts. It is certain, that, what by our operations we force, in regard to these animals, is done naturally every day in the brooks and ditches, where a curious observer will find many without heads or tails, and some without both; as also other fragments, all then in the act of completeing themselves; but, whether accidents have thus reduced them, or they purposely throw off parts of their own body for the reproduction of more animals, it is not easy to determine. They are liable to many accidents, by which they lose parts of their body, and must perish early, had they not a power of reproducing what was lost; they often are broken by the resistance of some hard piece of mud which they enter; and they are subject to a kind of gangrene,

rotting off the several parts of their bodies, and must inevitably perish, but for this surprising property.

The reproduction of several parts of lobsters, crabs, &c. is also one of the remarkable phenomena in nature. That, instead of an organical part of an animal broken off, another shall rise perfectly like it, may seem inconsistent with the modern system of generation, which supposes the animal to be wholly formed in the egg. Yet has the matter of fact been well attested by fishermen, and particularly by Reaumur and Perrault, whose skill and exactness in such things will not be questioned. The legs of lobsters, &c. consist each of five articulations; now, when any leg breaks by accident, as in walking, &c. which frequently happens, the fracture is always near the fourth articulation; and what they thus lose is reproduced after some time, that is, a part of a leg shoots out, consisting of four articulations, the first whereof has two claws as before; so that the loss is entirely repaired. If a lobster's leg be designedly broken off at the fourth or fifth articulation, reproduction always takes place; but, if the fracture be made in the first, second, or third articulation, the reproduction is very rare if things continue as they are. But, what is exceedingly surprising, is, that they do not; for, upon visiting in four days, the lobster maimed in these barren and unhappy articulations, all the other articulations are found broken off to the fourth; and it is suspected they have performed the operation on themselves, to make the reproduction of a leg certain. The part reproduced is not only perfectly like that retrenched, but also, in a certain space of time, grows equal to it. Hence

we frequently see lobsters with their two big legs unequal, and that in all proportions. This shows the smaller leg to be a new one. A part thus reproduced being broken, there is a second reproduction. The summer, the only season when the lobsters eat, is most favourable for reproduction, which is then performed in four or five weeks; whereas, at any other season, it requires eight or nine months. The small legs, as also the horns, are seldom reproduced, and very slowly. The experiment is mostly with ease tried on the common crab.—*Shaw's Nature Displayed.*

MICROSCOPIC PHENOMENA.

WHAT we have already considered makes but a small portion of the wonders which are unfolded to us by the microscope. This instrument has introduced us to a new world of vegetables and animals, and demonstrated that there are equal order and harmony in the mite's construction, as in that of the whale or elephant. The only difference is, our weakness of sight prevents our penetrating into the nature and organization of small bodies, which often escape our eyes, and can be perceived only by the assistance of glasses, which teach us, that the smallest objects, wholly unknown to our forefathers, have extension, parts, and a well organized form. The mention of some examples will lead us to acknowledge the power, wisdom, and goodness of that Deity, who affords into all existence and happiness.

Grains of sand appear of the same form to the naked eye, but seen through a microscope exhibit different shapes and sizes; globular, square, conical, and mostly irregular; and, what is more surprising, in their cavities have been found, by the microscope, insects of various kinds. In decayed cheese are multitudes of little worms, called mites, which, to the naked eye, appear like shapeless and confused moving particles, but, by the microscope, prove them of a very singular and curious figure. They have eyes, mouth, feet, and a transparent body, furnished with long hair in the form of prickles.

The mouldy substance on damp bodies exhibits a region of minute plants. Sometimes it appears a forest of trees, whose branches, leaves, flowers, and fruits are clearly distinguished. Some of the flowers have long, white, transparent stalks, and the buds, before they open, are little green balls which become white. The particles of dust on the wings of the butterfly prove, by the microscope, to be beautiful and well arranged little feathers.

> In down of every variegated dye
> Shines, fluttering soft, the gaudy butterfly.
> That powder which thy spoiling hand disdains,
> The form of quills and painted plumes contains.
> Not courts do more magnificence express,
> In all their blaze of gems and pomp of dress.
>
> *Browne.*

By the same instrument the surface of our skin has scales resembling those of a fish; but so minute, that a single grain would cover 250, and a single scale covers 500 pores, whence issues the insensible perspiration necessary to health; consequently, a single grain of sand can cover 125,000 pores of the human body.

The microscope displays, in each object, a thousand others which escaped recognition, in each of which others remain unseen, which even the microscope can never bring to view. What wonders should we see, could we continually improve those glasses invented to assist our sight! Imagination may, in some measure, supply the defect of our eyes, and serve as a mental microscope, to represent, in each atom, thousands of new and invisible worlds.

In contemplating the works of God, the effects of his wisdom and goodness are as evidently displayed in the spider's web, as in those laws which connect the sun and his circumrevolving planets. The microscope discovers, in miniature, new worlds, which ought to excite man's wonder, and urge him to religious reverence. Persons deprived of opportunity to examine the curious objects displayed by the microscope, will be glad to know what has been seen by others, and what themselves may contemplate with delight.

The mosses and grass with which the earth is covered, as with a carpet, are composed of many threads and small particles, into which they are divisible. The particles of water are so small, that millions of animalcules may be suspended on the point of a needle; how many then must there be in the rivers and seas! From a lighted candle there issue, in a minute, more particles of light than there are grains of sand in the whole earth; how vast then the number that flow in a day, or a year, or a century, from that immense body, the sun! How indefinitely small must those particles of odoriferous bodies be, which affect large spaces

for days, and even weeks, without any sensible loss of their weight!

Let us pass to the animated creation. In a summer's evening the air swarms with living creatures. Each drop of stagnant water contains a little world of animated beings. Each leaf of a tree is a colony of insects; every plant, every flower affords food for millions of creatures. Who but must have seen the innumerable swarms of flies, gnats, and other insects collected in the compass of a few yards! what prodigious shoals must there be over the whole earth, in the immense expanse of the atmosphere! How many millions of smaller insects, and worms, crawl on the ground, or live beneath its surface!

> The artificial convex will reveal
> The forms diminutive that each conceal;
> Some so minute, that, to the one extreme,
> The mite a vast Leviathan would seem;
> That yet of organs, functions, sense, partake,
> Equal with animals of larger make—
> In curious limbs and clothing they surpass
> By far the comeliest of the bulky mass.
> A world of beauties! that, through all their frame,
> Creation's grandest miracles proclaim.
>
> *Browne.*

Did not experiments and observations by the microscope prove the fact, it would be incredible that there are animals a million times smaller than a grain of sand; yet endowed with organs of nutrition, motion, &c. There are shell-fish so small, that, even through a microscope, they appear scarcely larger than a grain of wheat, and these are living animals enclosed in hard houses. How inconceivably fine are the spiders threads! as thousands would scarcely be as thick as common sewing silk. How small is the mite! and yet

this almost imperceptible atom, seen through a microscope, is a hairy animal, perfect in its limbs, active in its motions, of a regular form, full of life and sensibility, and provided with all requisite organs. Though scarcely visible to us, it is made up of parts infinitely smaller than the whole. How minute then must be the particles of those fluids which circulate through the veins of such animalcules!—*Shaw's Nature Displayed.*

SELECTIONS

OF

THE MOST REMARKABLE

PHENOMENA OF NATURE.

PART SECOND—MARINE.

PHENOMENA OF NATURE.

PART SECOND—MARINE.

CURRENTS—THEIR CAUSES.

To the inequalities at the bottom of the ocean, we must ascribe the origin of currents; for if the bottom were uniform and level, there could be no current but the general motion from east to west, and such as might occasionally be produced by the winds. But what incontestably proves that most currents are produced by the tides, and take their direction from inequalities at the bottom, is, that they uniformly follow the tides, and change their course at every ebb and flow. This is confirmed by the testimony of all navigators, who unanimously affirm, that, in those places where the tides are most impetuous, the currents are likewise most rapid.

Thus, it is apparent, that the tides give rise to currents, and that they always follow the direction

of the opposite hills or mountains between which they run. Currents produced by winds likewise observe the direction of the eminences concealed under the waters; for they seldom run in the direct path of the winds; neither do those produced by the tides invariably observe the course pointed out by their original cause.

To give a distinct idea of the origin of currents, let it be remarked, that they take place in all seas; that some are rapid, and others slow; that some are of great extent, both in length and breadth, and others shorter and narrower; that the same cause by which they are produced, whether it be the wind or the tides, frequently bestows on each a difference both in celerity and direction; that a north wind, for example, which ought to produce a general motion towards the south, gives rise, on the contrary, to a number of separate currents, very different both in their direction and extent, some running south, others south-east, and others south-west; some are rapid, others slow; some long and broad, and others short and narrow: In a word, their motions are so various and combined, that they lose all resemblance to their general cause. When a contrary wind blows, every motion is uniformly reversed; and the course of the different currents is precisely the same as would necessarily take place between two opposite and neighbouring hills upon the surface of the land, were it covered with water. Of this, the Maldiva and Indian islands, where the winds blow, and the currents run regularly for six months in opposite directions, afford most striking examples. The same thing has been remarked of currents between shoals and sand-banks. In general, all currents,

from whatever cause they proceed, have the same dimensions and the same direction through their whole course; but they differ greatly from each other in this respect. This uniformity and variety, can proceed from no other cause but the inequalities of the hills, mountains and valleys, at the bottom of the ocean; for, it is an established fact, that the current between two islands follows the direction of the coasts; and the same phenomenon is exhibited between shoals and sand-banks. The hills and mountains in the sea, therefore, may be considered as the banks which contain and direct these currents. Hence, a current is a river, the breadth of which is determined by that of the valley through which it runs; its rapidity is proportioned to the force by which it is produced, combined with the breadth of the interval through which it passes; and its direction is marked out by the position of the hills and other inequalities between which it shapes its course.

The most conspicuous currents of the ocean are those in the Atlantic, near the coast of Guinea. They extend from Cape Verd to the Bay of Fernandopo. They run from the west to the east, which is contrary to the general motion of the sea; and they are so rapid, that vessels sail in two days from Moura to Rio de Benin, about 150 leagues, but require six or seven weeks to return. It would even be impossible to clear these latitudes, were it not by means of the tempestuous winds that suddenly arise in them: but there are sometimes whole seasons in which the mariner is obliged to remain stationary, on account of perpetual calms, the sea having here no motion but what derives from the currents; and these always run

in upon the coasts, from which they extend not above twenty leagues. Near the island of Sumatra there are rapid currents, which run from south to north, and which have probably given rise to the bay between Malacca and India. We find similar currents between Java and the lands of Magellan, and between the Cape of Good Hope and Madagascar, especially on the African coast from Natal to the Cape. In the Pacific Ocean, upon the coasts of Peru, and the rest of America, the waters move from south to north, which is probably owing to the constant blowing of the south wind. The same motion from south to north has been remarked on the coasts of Brazil, from Cape St Augustine to the Antilles, and from the mouth of the Manilla straits, to the Philippines and Japan.

There are violent currents in the neighbourhood of the Maldiva Islands; and between these islands, as already observed, the currents run alternately in opposite directions six months in the year, and are probably occasioned by the trade winds.

We only here enumerate such currents as are remarkable both for their extent and their rapidity; because, the number of lesser currents is almost infinite. The tides, the winds, and every cause that agitates the waters produce currents, which are more or less perceptible in different places. We have already remarked, that the bottom of the sea is like the land, intersected with mountains and valleys, shoals and sand-banks. In all the mountainous places the currents must necessarily be violent; and where the bottom is smooth and level, they are almost imperceptible; for the rapidity of a current must augment

in proportion to the obstacles the water meets with. The current between two chains of mountains will be more or less violent, in proportion to their distance. The same thing must happen between two banks of sand, or two adjacent islands. It is accordingly remarkable, that in the Indian ocean, which is intersected with an innumerable quantity of islands and sand-banks, there are every where currents, which, by their rapidity, render navigation extremely dangerous. Currents are not only occasioned by inequalities at the bottom, but a similar effect is produced by the coasts, from which the waters are repelled to greater or less distances. This regorging of the waters, may be rendered perpetual and violent by particular circumstances: an oblique position, for example, of a coast, its contiguity to a bay or a great river, a promontory, or any particular obstacle to the general movement of the waters, will always give rise to a current. Now, as nothing is more irregular than the bottom and the coasts of the sea, the number of currents that every where appear, ought not to create surprise—*Buffon's Natural History.*

WHIRLPOOLS.

WHIRLPOOLS seem to be nothing else but circular motions of the waters, occasioned by the action of two or more opposite currents. The Euripus, so famed by the death of Aristotle, alternately absorbs and rejects the water seven times every twenty-four hours. This whirlpool is near the coast of Greece. Charybdis, which lies near

the Straits of Sicily, rejects and absorbs the water thrice in twenty-four hours. We are uncertain as to the number of alternate motions in other whirlpools.

The largest known whirlpool is in the sea of Norway, the circumference of which exceeds twenty leagues. It absorbs, for six hours, water, whales, ships, and any thing that approaches it; and the next six hours are employed in throwing them up again.

To account for these whirlpools, it is unnecessary to have recourse to an abyss, or to pits in the bottom of the sea, which are perpetually swallowing the waters. It is well known, that when water has two directions, the combination of these motions produces a whirling, and exhibits the appearance of a void space in the middle. In the same manner, whirlpools in the sea are occasioned by two or more contrary currents; and as the tides are the principal cause of currents, and, of course, they run for six hours in contrary directions, it is not surprising that the whirlpools which are produced by them should alternately reject and absorb every thing within their reach, during the same portions of time.—*Buffon's Natural History.*

WATER-SPOUTS.

THERE are two species of waterspouts; the first is nothing but a thick cloud, compressed and surrounded by opposite winds blowing from different coasts at the same time, which make it assume a cylindric figure, and fall down by its own gravity.

The quantity of water is so immense, and the rapidity of the fall so great, that if, unfortunately, one of these spouts break upon a ship, it dashes it to pieces, and sinks it in an instant. It is alleged, and with probability, that waterspouts may be broken and dissipated by the commotion excited in the air by the firing of cannons, which corresponds with the dissipation of thunder-clouds by the ringing of bells.

The other species of waterspout is called a *typhon*, and is very frequent in the Chinese Sea. The typhon descends not from the clouds, nor is produced by the action of opposite winds. It, on the contrary, rises from the water to the heavens with amazing rapidity. Whirlwinds often run along considerable tracts, bearing down houses, trees, and every obstacle that they meet with. But typhons remain always in the same places, and can be owing to nothing but subterraneous fires; for the sea is then in the greatest agitation, and the air is so impregnated with sulphureous exhalations, that the sky appears to be covered with a copper-coloured crust, although there be no clouds, and the sun or the stars appear through the vapour. It is to these subterranean fires that we must ascribe the warmth of the Chinese Sea in winter, where these typhons are very frequent.

M. Gentil, in his Voyage round the World, describes waterspouts in the following manner: "At eleven o'clock before noon, the sky being cloudy, we saw round our ship, at the distance of about a quarter of a league, six waterspouts, which began with a noise like that of water running below ground, and gradually increased till it resembled the hissing noise occasioned by a high wind among

the ropes of a ship. We first perceived that the sea began to boil; and its surface rose about a foot and a half. The top of this elevated part was covered with a thick fog, or rather smoke, which formed itself into a canal, and mounted to the clouds. These canals bended, according as the wind carried the clouds to which they were attached. Notwithstanding the motion communicated to the clouds by the wind, the canals not only adhered to them, but seemed to stretch out or contract, in proportion as the clouds rose higher, or sunk down in the atmosphere.

These appearances gave us much uneasiness; and our sailors, instead of encouraging each other, increased their fears by dreadful stories. If these spouts, said they, fall upon the ship, they will lift her up, and then plunge her to the bottom. Others maintained, with a decisive tone, that they would not lift the vessel, but that, being full of water, if the ship went forward, she would break their communication with the sea, and that the great body of water, by falling perpendicularly on the vessel, would break her in pieces.

To prevent this misfortune, they lowered the sails, and charged the cannon. It is a general opinion among sailors, that the firing of cannon, by agitating the air, bursts and disperses water-spouts. But we were not under the necessity of having recourse to this expedient; for, after coursing round the ship for about ten minutes, some being about a quarter of a league from us, and others nearer, the canals became gradually narrower, detached themselves from the surface of the sea, and then entirely vanished."

Many facts remain still to be known before these

phenomena can be properly explained. To me it appears, that if there be in particular places, at the bottom of the sea, a mixture of sulphur, bitumen, and mineral substances, these may occasionally be inflamed, which will produce, like the explosion of gunpowder, a great quantity of air; and that this air, newly generated, and rarified to a prodigious degree, mounts with rapidity, and may elevate the water from the sea to the clouds. In the same manner, if a perpendicular current of air be produced by the explosion of sulphureous matter in a cloud, the whole of its water may follow this current, and give rise to a waterspout from the clouds to the sea. But, it must be acknowledged, that this account of the last species of spout is not more satisfactory than that which we have given of those produced by contrary winds; for, it may be asked, why those spouts, which originate from the clouds, are not as common on land as upon the sea?—*Buffon's Natural History.*

MILKY APPEARANCE IN THE OCEAN.

It has been remarked by several navigators, in their passage from Mocha to Bombay, Surat, &c. that they had discovered in the night spots of water as white as milk, and could never assign any reason for it; and many have been so much alarmed, that they have immediately hove to, and sounded. Captain Newland, in his passage across the seas in the Kelsall, discovered all of a sudden, about eight o'clock in the evening, the water all

round as white as milk, intermixed with streaks, or serpentine lines of black water. He immediately drew a bucket of it, and carried it to the light, where it appeared just as other water. He drew several more and found it the same. Some he kept until next morning, when he could perceive no difference from that along side. They had run by the log 50 *m.*, from the time they first observed it till daylight, and during all that time the water continued white as milk, but at full daylight it was of its usual colour. The next evening, about seven o'clock, the water appeared again as white as before. He then drew another bucket, and carried it to a very dark place, and, holding his head close to the bucket, could perceive with his naked eye, an innumerable quantity of animalculæ floating about alive, which enlightened that small body of water to an amazing degree. Hence he concludes, that the whole mass of water must be filled with this small fish spawn, or animalcules, and that this is doubtless the reason of the water appearing so white in the night time.—*Philosophical Transactions, Vol.* 13.

THE YELLOW SEA.

On the twenty-fifth of July, we rounded the promontory of Shantung, and entered the Yellow Sea; after which, we coasted along at no great distance from the land, and the weather being quite clear, our view of the shore was most satisfactory.

We sailed on directly across this shallow sea for two whole days without seeing land, and gra-

dually diminishing the depth of water, till at last we began to have some apprehension that we should fairly stick in the mud before our object was accomplished. At sunset, on the twenty-seventh, no land could be perceived from the mast-head, although we were in less than five fathoms water. Before it became quite dark, however, we caught just a glimpse of the tops of some tall trees, after which, we anchored in twenty-one feet water. Before the day broke next morning, however, the tide had fallen a whole fathom, which brought the ship's bottom within three feet of the ground. Our business, however, being to open a communication with the shore at all hazards, the anchor was weighed, and sail again made to the westward. It was soon afterwards discovered, that the brig was actually sailing along with her keel in the mud, which was sufficiently indicated by a long yellow train in our wake. Some inconvenience was caused by this extreme shallowness, as it retarded our headway, and affected the steering; but there was in reality not much danger, as it was ascertained, by forcing long poles into the ground, that for many fathoms below the surface in which the sounding lead rested, and from which level the depth of water is estimated, the bottom consisted of nothing but mud, formed of an impalpable powder, without the least particle of sand or gravel.

The water, at every part of this sea over which we were sailing, was contaminated by the intermixture of mud, slightly yellow in its colour, and hence its appropriate name. In process of time, the deposits from the innumerable streams which fall into this great gulf from China and Tartary

must fill it up entirely, and the Yellow Sea will become a vast alluvial district, like Bengal or Egypt. The present inclination of the bottom is about a foot in a geographical mile, or somewhat less than one in five thousand; and it is probable that the bottom of the Yellow Sea, as it rises, will likewise gradually approximate in a horizontal plain.—*Hall's Voyage to Loo-Choo.*

THE DEAD SEA.

THE Dead Sea below, upon our left, appeared so near to us, that we thought we could ride thither in a very short space of time. Still nearer stood a mountain upon its western shore, resembling in its form the cone of Vesuvius, and having also a crater upon its top, which was plainly discernible. The distance, however, is much greater than it appears to be; the magnitude of the objects beheld in this fine prospect causing them to appear less remote than they really are. The atmosphere was remarkably clear and serene; but we saw none of those clouds of smoke, which, by some writers, are said to exhale from the surface of Lake Asphaltites, nor from any neighbouring mountain. Every thing about it was, in the highest degree, grand and awful. Its desolate, although majestic features, are well suited to the tales related concerning it by the inhabitants of the country, who all speak of it with terror, seeming to shrink from the narrative of its deceitful allurements and deadly influence:—"Beautiful fruit," say they, "grows upon its shores, which is no

sooner touched, than it becomes dust and bitter ashes." In addition to its physical horrors, the region around is said to be more perilous, owing to the ferocious tribes wandering upon the shores of the lake, than any other part of the Holy Land. A passion for the marvellous has thus affixed for ages false characteristics to the sublimest associations of natural scenery in the whole world; for, although it be now known that the waters of this lake, instead of proving destructive of animal life, swarm with myriads of fishes; that, instead of falling victims to its exhalations, certain birds make it their peculiar resort; that shells abound upon its shores; that the pretended "fruit, containing ashes," is as natural, and as admirable a production of nature, as the rest of the vegetable kingdom; that bodies sink or float in it according to the proportion of their gravity to the gravity of the water; that its vapours are not more insalubrious than those of any other lake; that innumerable Arabs people the neighbouring district;—notwithstanding all these facts are now well established, even the latest authors by whom it is mentioned, and one among the number, from whose writings some of these truths have been derived, continue to fill their descriptions with imaginary horrors and ideal phantoms, which, though less substantial than the "black perpendicular rocks" around it, "cast their lengthened shadows over the waters of the Dead Sea." The ancients, as it is observed by the traveller now alluded to, were much better acquainted with it than are the moderns; and it may be added, the time is near at hand, when it will be more philosophically exa-

mined. The present age is not that in which coun tries so situated can long continue unexplored The thirst of knowledge, and the love of travel have attained to such a pitch, that every portio of the globe will be ransacked for their gratifica tion.—*Dr Clarke's Travels.*

SUBMARINE VOLCANOES, AND FORMATION O ISLANDS.

Besides the convulsions of nature displaye d i volcanoes, other operations are carried on belo the fathomless depths of the sea, the nature which can only be conjectured by the effects pro duced. Nor is it more astonishing, that inflam mable substances should be found beneath th bottom of the sea, than at similar depths on land and that there also the impetuous force of fir should cause the imprisoned air and elastic gase to expand; and, by its mighty force, should driv the earth at the bottom of the sea above its sur face. These marine volcanoes are perhaps mor frequent, though they do not come so often with in the reach of human observation, than those o land; and stupendous must be the operations car ried on, when matter is thrown up to an exten which the ingenuity of man does not enable hin to reach by fathoming. Many instances have oc curred, as well in ancient as in modern times, o islands having been formed in the midst of the sea and their sudden appearance has constantly bee preceded by violent agitation of the surrounding waters, accompanied with dreadful noises; and

in some instances, by fiery eruptions from the newly formed isles, which are composed of various substances, frequently intermixed with a considerable quantity of volcanic lava. Such islands remain for ages barren, but in a long course of time become abundantly fruitful. It is a matter of curious inquiry, whether springs are found on such newly created spots, when the convulsions which gave them birth have subsided.

Seneca asserts, that in his time the island of Therasea, in the Egean Sea, was seen to rise in this manner by several mariners, who were sailing near the point of its ascent. Pliny's relation is still more extraordinary; for he says, that, in the Mediterranean, thirteen islands emerged at once from the sea.

On the 22d of May 1707, a severe earthquake was felt at Stanchio, an island of the Archipelago; and, on the ensuing morning, a party of seamen, discovering not afar off what they believed to be a wreck, rapidly rowed towards it; but finding rocks and earth, instead of the remains of a ship, hastened back, and spread the news of what they had seen in Santorini, another of these islands. However great the apprehensions of the inhabitants were at first sight, their surprise soon abated; and, in a few days, seeing no appearance of fire or smoke, some of them ventured to land on the new island. Their curiosity led them from rock to rock, where they found a kind of white stone, which yielded to the knife like bread, and nearly resembled that substance in colour and consistence. They also found many oysters sticking to the rocks; but while they were employed in collecting them, the island moved and shook under their

feet, on which they ran with precipitation to their boats. Amid these motions and tremblings, the island increased not only in height, but in length and breadth; still occasionally, while it was raised and extended on the one side, it sunk and diminished on the other.

The most recent account is that of a traveller, who passed the island in 1811 at some distance. It appeared to him like a stupendous mass of rock, but was not inhabited or cultivated. It had then long ceased to burn.—*Shaw's Nature Displayed.*

INUNDATION AT ST PETERSBURG IN 1824.

THERE are few events in the physical world that have excited so much attention, and done so much mischief, as the tempest of the 18th and 19th November 1824, and the extraordinary inundation which accompanied it.

The storm began on the coasts of England and Holland, and, after having occasioned numerous shipwrecks on the north coast of Jutland, it advanced to Gottenburg and Stockholm, keeping more and more to the direction of N.W. and S.E. On the 13th and 14th November, the barometer of Stockholm fell lower than it had ever been seen below even that which took place at the great earthquake of Messina in 1783. On the following days the sky was cloudy and the weather variable; but on the night of the 18th, and morning of the 19th November, a storm arose, which, after wrenching the vessels from their moorings, dashed them against each other, unroofed houses, and covered

the roads with uprooted trees. A sheet of the copper roof of the palace of the Princess Sophia, about sixteen yards long, was carried off to the square of Gustavus Adolphus. Twenty-five ships, which were lying near the bridge of Munlbron, on Lake Maelar, were carried away with the bridge, and submerged.

Analogous effects were experienced at Gottenburg, Vibourg, and Udivalla on the 18th. At Udivalla, the sea rose *eight* feet above the greatest elevation, and its motion was so rapid that many persons had not time to escape. In the higher parts of the town, whole houses were carried away, and some ships were transported into the fields, 4000 feet from their anchorage. One vessel of 150 tons was actually wrecked in the middle of a street.

At Christiana on the 18th, at 7 *p.m.*, the waters of the Firth rose suddenly more than three yards above their mean level. After producing terrible destruction, they sunk suddenly below their ordinary level; but next day they rose again with such rapidity, that a new inundation was apprehended in the lower part of the town, as well as in the Fauxbourgs of Waterland and Lierdingen.

For several days before the tempest appeared at St Petersburg, gusts of wind from the S.W. carried off several roofs in Wassili Ostrow. On the 18th the storm increased, and the waters of the Neva rose to the height of the parapets. At 9 *a.m.* of the 19th, they quitted their channel, and spread themselves over all the town to such a height, that, on the quay of the Neva, the lamp-posts were not visible. All the wooden bridges, great and

small, were carried away, and the houses inundated to the height of ten feet, and even to the height of five feet in the higher parts of the city. Entire houses tumbled down, and four-wheeled carriages were hurried away by the waves. Barks of the largest size were carried over the quays, and shipwrecked in the middle of the city, where boats were ready to collect the unfortunate inhabitants of the lower stories. A brig remained overset in the middle of the street of the Grand Perspective. The parapets along the banks of the river, which were built of enormous blocks of granite, were opened in several places. The wind was so violent, that it rolled up like sheets of paper, and carried off the plates of white iron which covered the roofs of the houses. To the distance of five leagues from St Petersburg, the rise and the fury of the waters were not less remarkable. Near Catherinoff a whole village was carried away, and a number of country houses were destroyed. At Cronstadt the sea everywhere rose fourteen feet; and the Imperial fleet of twelve ships and four frigates, which lay in the roads, were torn from their cables, and dashed upon the coast. A ship of 100 guns disappeared entirely. The wooden batteries were wholly razed on the side opposite to the sea, and those built with stone were greatly injured. The gun-carriages, separated from the cannon, floated on the waves.

These facts will enable us to form some idea of the extraordinary rapidity of this torrent, and its elevation. The following particulars will show the extent of the devastation, and of the losses which accompanied them, and of the number of human victims which perished. A whole regiment of ca-

rabineers, men and horses, was drowned. The carabineers had ascended the roof of the barracks for safety, but they were all swept away. At the foundry of M. Clark, four versts from the city, on the road of Peterhoff, the workmen, perceiving too late the progress of the waters, saw their own habitations, containing their wives and their children, swallowed up by the sea. More than fifty bodies were extricated at that place. The number of sufferers has been estimated at from 500 to 700, and the loss at 150 millions, (of rubles, we presume). Among these losses are mentioned 15,000 tons of hemp, 500 oxen, 200,000 quintals of hemp, 2,460,000 lib. of sugar. All these ravages, which have been compared to the destruction sustained by Moscow in the late war, were produced between nine *a. m.* and three *p. m.* The rise of the waters was sixteen feet; whereas in 1777, when a similar disaster happened, the rise was only fourteen feet.

This phenomenon has been ascribed to one of two causes; by some to the effect of the wind in accumulating and pushing up the waters of the rivers, and by others to some subterraneous convulsion. This last opinion is supposed to be countenanced by the sudden elevation and depression of the sea at Christiana; by the spontaneous breaking forth of new springs in the Upper and Lower Rhine; by crevices which have been opened in the solid ground; by a slight earthquake which was experienced at Portsmouth and in the Alps; and by the volcanic eruption of Donnersberg, which, for the first time, discharged flames of ashes.—*The Edinburgh Journal of Science, No.* 4.

INSTINCT AND CURIOUS HABITS OF DIFFERENT KINDS OF FISH.

THE deep recesses of the ocean are inaccessible to mankind, which prevents us from having much knowledge of the arts and government of its inhabitants.

One of the baits used by the fisherman is an animal called an old soldier. His size and form are somewhat like the craw-fish, with this difference, that his tail is covered with a tough membrane instead of a shell; and to obviate this defect, he seeks out the uninhabited shell of some dead fish that is large enough to receive his tail, and carries it about with him as part of his clothing or armour.

On the coasts about Scarborough, where the haddocks, cods, and dog-fish are in great abundance, the fishermen universally believe that the dog-fish make a line, or semicircle, to encompass a shoal of haddocks or cod, confining them within certain limits near the shore, and eating them as occasion requires. For the haddocks and cod are always found near the shore without any dog-fish among them, and the dog-fish further off without any haddocks or cod; and yet the former are known to prey upon the latter, and in some years devour such immense quantities as to render this fishery more expensive than profitable.

The remora, when he wishes to remove his situation, as he is a very slow swimmer, is content to take an outside place on whatever conveyance is

going his way; nor can the cunning animal be tempted to quit his hold of a ship when she is sailing, not even for the lucre of a piece of pork, lest it should endanger the loss of his passage; at other times he is easily caught with the hook.

The crab-fish, like many other testaceous animals, annually changes its shell; it is then in a soft state, covered only with a mucous membrane, and conceals itself in holes in the sand or under weeds. At this place a hard shelled crab always stands sentinel, to prevent the sea insects from injuring the other in its defenceless state; and the fishermen from his appearance know where to find the soft ones, which they use for baits in catching other fish. And though the hard shelled crab, when he is on this duty, advances boldly to meet the foe, and will with difficulty quit the field; yet at other times he shows great timidity, and has a wonderful speed in attempting his escape; and, if often interrupted, will pretend death like the spider, and watch an opportunity to sink himself into the sand, keeping only his eyes above.

There is a cataract on the river Liffey in Ireland, about nineteen feet high. Here, in the salmon season, many of the inhabitants amuse themselves in observing these fish leap up the torrent. They dart themselves quite out of the water as they ascend; and fall back many times before they surmount it, and baskets made of twig are placed near the edge of the stream to catch them in their fall.

I have observed, as I sat by a spout of water, which descends from a stone trough about two feet into a stream below, at particular seasons of the year, a great number of little fish called minums

or pinks, throw themselves about twenty times their length out of the water, expecting to get into the trough above. This evinces that the storgee, or attention of the dam to provide for the offspring, is strongly exerted amongst the nations of fish, where it would seem to be the most neglected, as these salmon cannot be supposed to attempt so difficult and dangerous a task without being conscious of the purpose or end of their endeavours. It is further remarkable, that most of the old salmon return to the sea before it is proper for the young shoals to attend them; yet that a few old ones continue in the rivers so late, that they become perfectly emaciated by the inconvenience of their situation, and this apparently to guide or to protect the inexperienced brood.—*Dr Darwin's Zoonomia.*

TURTLE.

THOUGH the pearl oyster, as hath been said, was incapable of being eaten, yet that defect was more than repaid by the turtle—a dainty which the sea at this place furnished us with in the greatest plenty and perfection. There are generally reckoned four species of turtle; that is, the trunk-turtle, the loggerhead, the hawksbill, and the green turtle. The two first are rank and unwholesome; the hawksbill (which affords the tortoise-shell) is but indifferent food, though better than the other two; but the green turtle is generally esteemed, by the greatest part of those who are acquainted with its taste, to be the most delicious of all eat-

ables; and that it is a most wholesome food, we are amply convinced by our own experience; for we fed on this last species, or the green turtle, near four months; and, consequently, had it been in any degree noxious, its ill effects could not possibly have escaped us. At this island we caught what quantity we pleased with great facility; for, as they are an amphibious animal, and get on shore to lay their eggs, which they generally deposite in a large hole in the sand, just above the high water-mark, covering them up and leaving them to be hatched by the heat of the sun, we usually dispersed several of our men along the beach, whose business it was to turn them on their backs when they came to land; and the turtle being thereby prevented from getting away, we brought them off at our leisure. By this means we not only secured a sufficient stock for the time we staid on the island, but we carried a number of them with us to sea, which proved of great service, both in lengthening out our store of provisions, and in heartening the whole crew with an almost constant supply of fresh and palatable food. For the turtle being large, they generally weighing about 200 pounds weight each, those we took with us lasted near a month; so that, before our store was spent, we met with a fresh recruit on the coast of Mexico, where, in the heat of the day, we often saw great numbers of them fast asleep, floating on the surface of the water. Upon discovering them, we usually sent out our boat with a man in the bow, who was a dexterous diver; and, as the boat came within a few yards of the turtle, the diver plunged into the water, taking care to rise close upon it; when, seizing the shell near the tail, and

pressing down the hinder parts, the turtle was thereby awakened, and began to strike with its claws, which motion supported both it and the diver, till the boat came up and took them in. By this management we never wanted turtle for the succeeding four months in which we continued at sea; and though, when at the island of Quibo, we had already been three months on board, without otherwise putting our foot on shore than in the few days we staid there, (except those employed in the attack at Paita), yet, in the whole seven months, from our leaving Juan Fernandez to our anchoring in the harbour of Chequetan, we buried no more in the whole squadron than two men—a most incontestable proof that the turtle, on which we fed for the last four months of this term, was at least innocent, if not something more.

Considering the scarcity of other provisions on some part of the coast of the South Seas, it appears wonderful, that a species of food so very palatable and salubrious as turtle, and there so much abounding, should be proscribed by the Spaniards as unwholesome, and little less than poisonous. Perhaps the strange appearance of this animal may have been the foundation of this ridiculous and superstitious aversion, which is strongly rooted in the inhabitants of those countries, and of which we had many instances during the course of this navigation. I have already observed, that we put our Spanish prisoners ashore at Paita, and that the Glocester sent theirs to Manta; but, as we had taken in our prizes some Indian and Negro slaves, we did not dismiss them with their masters, but continued them on board, as our crews were thin, to assist in navigating our

ships. These poor people being possessed with the prejudices of the country they came from, were astonished at our feeding on turtle, and seemed fully persuaded that it would soon destroy us; but, finding that none of us died, nor even suffered in our health by a continuation of this diet, they at last got so far the better of their aversion as to be persuaded to taste it, to which the absence of all other kinds of fresh provisions might not a little contribute. However, it was with great reluctance, and very sparingly, that they first began to eat of it; but the relish improving upon them by degrees, they at last grew extremely fond of it, and preferred it to every other kind of food, and often felicitated each other on the happy experience they had acquired, and the luxurious and plentiful repasts it would always be in their power to procure, when they should again return back to their country. Those who are acquainted with the manner of life of these unhappy wretches, need not be told, that, next to large draughts of spirituous liquors, plenty of tolerable food is the greatest joy they know; and, consequently, the discovering the means of being always supplied with what quantity they pleased, of a food more delicious to the palate than any their haughty lords and masters could indulge in, was, doubtless, a circumstance which they considered as the most fortunate that could befal them. After this digression, which the prodigious quantity of turtle on the island of Quito, and the store of it we thence took to sea, in some measure led me into, I shall now return to our own proceedings.—*Anson's Voyage round the World.*

PEARLS AND PEARL FISHERIES.

PEARLS, though esteemed among gems by our jewellers, and highly valued in all ages, arise merely from a disease in the animal that produces them, analogous to bezoars, and other stony concretions, in several other kinds of animals.

The fish in which pearls are usually produced, is commonly called the East Indian pearl oyster. Besides this, many others produce pearls; as the common oyster, the mussel, and several others, whose pearls are often very good; but those of the Indian berberi, or pearl oyster, are superior. The seed pearls, called *ounce pearls*, from their being sold by weight, are numerous and common; but, like diamonds, among the multitude of small ones, smaller and larger are found. As they increase in size, they are proportionably less frequent, which is the cause of the increased price. Philip the II. of Spain had a pearl, perfect in shape and colour, of the size of a pigeon's egg. The finest and truest shape of the pearl, is a perfect sphere; but pearls of a considerable size, when pear-shaped, as is frequent, are not less valued, as they serve for ear-rings and other ornaments. Their colour ought to be a pure white, clear and brilliant, perfectly free from any foulness, spot or stain, with their surfaces naturally smooth and glossy; for they have a natural polish, which art is unable to improve.

Though these ornaments are met with in all seas, the most esteemed are those of Asia and the eastern

coast of Africa. In Madura, east of Malabar, are many pearl fisheries. Tutucorin is the principal place on the fishery coast. When the Portuguese were in power, the taking of oysters between Ceylon and the continent was very deservedly styled the *fishery*, though some preferred the pearls taken near Baharen, in the Persian Gulf, or at Hainan, on the coast of China.

The season of the fishery was the beginning of May, and the duration about a fortnight. Of its commencement, the sovereign gave public notice; and there repaired to the place an indefinite number of fishing vessels, with divers, who plunged and brought up the oysters in little baskets, till the boats were sufficiently laden. They were then carried to shore, where they were buried, till, by the solar heat, the fish dried up, and the perils were easily taken out. The people employed, at sea and on shore, amounted to many thousands; and the pavilions and tents for their accommodation made a fine appearance. When the pearls were extracted, cleansed and dried, they passed them through sieves, by which their sizes were distinguished. The smallest, called seed-pearl, they sold by weight, and the rest, according to size and beauty, from a few shillings to ten or twenty pounds, and sometimes more.

The wretched divers go repeatedly down, only resting ten minutes or a quarter of an hour between each dive, during the twelve hours. A cord is fastened under the arms, and a large stone likewise to the great toe, the other ends being held by persons in the boat. On reaching the bottom, the diver slips from the stone, which is then drawn up, and collects in a sack, with a mouth distend-

ed by a hoop, all the mussels or oysters he can; and, when nearly exhausted, pulls the rope, on which he is drawn up by his comrades in the boat. To defend himself, he has a sharp knife; for sharks at times attack him, and a large flat fish, there common, keeps the diver under itself and drowns him. In Percival's account of Ceylon, mention is made of divers continuing five minutes under; that they go down by fives, alternately relieving each other. The fish are thrown in fenced places to die, and cause an inconceivable stench; but the pearls are supposed to be better in consequence. However fine the specimens (and their value increases in proportion to their size and colour), they become yellow by exposure to the air, or to dampness.

In Eastern Tartary are a variety of rivers, celebrated for pearl fishing; but the pearls, on account of their defects in shape and colour, are little valued by Europeans. Many rivulets in Livonia produce pearls, almost equal in size and clearness to the Oriental ones. There are several fisheries in both East and West Africa, and a considerable one round some small islands near Sofala; but the people, instead of exposing the oysters to the sun's warmth, to induce them to open, lay them upon embers, by which the pearls contract a dull redness, which, robbing them of their natural lustre, injures their value. In the sea of California, are very rich pearl fisheries. In Japan are found pearls of great price; also in the Red Sea, the Indian Ocean, and on the part of Arabia Felix named *Baharen*, adjoining to the Persian Gulf; likewise on the low coast about Gunibroom, east of the Persian Gulf; and many of the finest kind are

met with on the coasts of Ceylon. They are plentiful in Baharen, between the coast of Arabia Felix and Ormus; whence they are transported by Aleppo to Leghorn, and circulated through Europe.

In the time of Pliny, pearls were the most valuable and esteemed of all precious stones; and Jesus Christ, in comparing the kindgom of Heaven to a pearl, indicated that they were then held in high estimation. Servilia, the mother of Marcus Brutus, is stated to have presented one to Cæsar, worth 50,000*l.* Sterling; and Cleopatra is said (but the story is not believed), to have dissolved one worth 250,000*l.*, which she drank at a supper.—*Shaw's Nature Displayed.*

GREAT BRITAIN NOT ALWAYS AN ISLAND.

THE island of Great Britain appears to have been formerly a part of the continent; and that England was once joined to France, the narrowness of the strait, and the sameness of the strata of stone and of earth on the opposite sides, are a sufficient indication. If we suppose, says Dr Wallis, that France was connected to England by an isthmus between Calais and Dover, two tides would necessarily strike with violence against each side of it twice every twenty-four hours; and the operation of the sea, both on the east and west of this isthmus, would, in the course of time, necessarily wear away such a narrow neck of land as we have supposed. The tides acting with violence not only

against this isthmus, but also against the coasts of France and of England, must have carried away vast quantities of earth, sand, and clay, from every part on which the waves exerted their fury. Their course, however, being interrupted by the isthmus, they would not, as might be imagined, deposit their sediments upon its shores, but would transport and deposit them in the great plain, which now forms the marsh of Romney, and is four miles broad and eight long; for no man, who has ever seen this plain, can possibly doubt of its having been formerly covered with the sea, as, without the intervention of the dikes of Dimchurch, the spring-tides would still overflow a great part of it.

The German sea would act in the same manner against this isthmus and against the coasts of England and Flanders, and would carry its sediments into Holland and Zealand, the soil of which was formerly under the waters, though it is now elevated forty feet above them. On the English coast, the German sea must have occupied that large valley which commences at Sandwich, runs by Canterbury, Chatham, and Chilham, and terminates at Ashford, a space of more than twenty miles. Here the land is much more elevated than it was in ancient times; for, at Chatham the bones of a hippopotamus have been found buried at the depth of seventeen feet, and likewise anchors of ships and sea-shells.

It is extremely probable, says Mr Ray, that the Island of Great Britain was formerly joined to France. Whether it was disjoined by an earthquake, or an irruption of the ocean, or by the operation of men, we know not. But the former

junction of Britain to the continent is apparent from the identity of the rocks and different strata, at the same elevation, on the opposite coasts; and from the similar extent of the rocks on each side, being both about six miles. The narrowness of this strait, which exceeds not twenty-four English miles, and its shallowness, when compared to the depth of the neighbouring sea, render it probable that England has been separated from France by some accident. To these proofs we might add, that wolves and bears formerly existed in this island. It is not probable that these animals could swim over, nor that such destructive creatures would be transported by men; for, in general, the noxious animals of the continent are found in all those islands which are very near it, but never in those that are remote. This fact was remarked by the Spaniards when they arrived in America.—*Buffon's Natural History.*

SELECTIONS

OF

THE MOST REMARKABLE

PHENOMENA OF NATURE.

PART THIRD—CELESTIAL.

PHENOMENA OF NATURE.

PART THIRD—CELESTIAL.

THE SUN.

THE sun was supposed, by Sir Isaac Newton, to be a solid globe of fire, so hot as to afford, at the distance of ninety-five millions of miles, the light and heat we daily experience from his beams. But as that great philosopher was enabled to make his wonderful discoveries from the information which a small telescope afforded him, subjecting his own observations, and those of all who had gone before him, to the unerring laws of mathematical demonstration—so succeeding philosophers, having glasses much exceeding his in magnifying power, together with his discoveries to begin upon, and his rules of demonstration to direct them, have consequently, since his time, much extended the science of astronomy, and have obtained such results, with respect to the nature of the sun, as warrant their widely differing from him in opinion.

The theory now supported, and which seems to be well established by the discoveries of the late Sir William Herschell, is, that the sun is a solid, opaque globe, adapted to animal life, but surrounded with a very extensive and luminous atmosphere.

The sun, when viewed through a telescope, seems, at times, far from uniformly luminous, having sometimes black spots on his surface. They first appear on the eastern limb, and cross over the disc to the western. At the end of about thirteen and a half days from their first appearance, they vanish, and are invisible for about thirteen days and a half more, when, if they are not in the mean time dissolved, they reappear in the east.

From this circumstance it has been discovered, that the sun has a rotatory motion on his own axis, and that he performs a revolution in the space of twenty-five days ten hours. Previously to the days of Herschell, these black spots amused and perplexed philosophers very much. His opinion was, that the solar sphere has mountains on its surface not less than three hundred miles high; and that, on their top, the atmosphere being by some means disturbed, becomes so thin as to permit us to have a glimpse of the sun's opaque body. It is observed of these spots, that after they disappear, the places where they were become brighter than the rest of the solar disc; that the longer they are in forming, the slower they are in dissolving; and that their sudden appearance is succeeded by an equally sudden disappearance. Two spots will sometimes unite, and, at other times, one will divide into two, which will recede from each other with considerable velocity. Their sizes are va-

rious. Some are imperceptibly small, and others as large as the whole continent of Europe, Asia, and Africa. In the year 1779, there was one visible to the naked eye, of not less than fifty thousand miles diameter. None of them ever continued longer than seventy days, while some form and dissolve in a few hours. The sun is sometimes free from them, but was never known to be so for a whole year together.

A little after sunset in the month of March, and a little before sunrise in the month of September, a very remarkable phenomenon is seen, called the *zodiacal light*. It is supposed to be part of the sun's luminous atmosphere flying off in the plane of his equator, by reason of his great velocity, or centrifugal force. It has a pyramidal form, with the sun for its basis, and a luminous appearance resembling the *aurora borealis*.

The similarity of the sun to the other globes that compose the solar system, namely, its being diversified with hills and dales, and its rotation on its own axis, renders it more than probable that its surface is inhabited. The supposition of the solar plains being too hot for the accommodation of such living creatures as we are acquainted with, does not rest on a solid foundation. There are many arguments to prove, that the sun's rays only produce heat when they act upon a proper medium; therefore the sun's surface may be as cool as the earth's. But, should it be as hot as we may suppose from our own experience of the effects of the heat at this distance, yet there may be beings whose organs are adapted to their condition.—However, for the present we leave every one the liberty of

making the sun the habitation of whatever kind of *beings* his imagination is able to produce.—*Taylor's "Key to the Knowledge of Nature."*

THE EARTH AS SEEN FROM THE MOON.

THE earth is to the moon, with respect to light, what the moon is to the earth; but it will be seen that only one half of the moon receives benefit from the earth's reflected light.

Presenting the same side continually towards the earth, half of the lunar inhabitants (as probably the moon is inhabited) will never see the earth; but will be near a fortnight in total darkness, having light neither from sun nor moon. Should a Lunarian, whose usual place of residence is on the farther side of the moon, have his curiosity excited by the marvellous tales of travellers from this side of the lunar surface, respecting a large body, more than thirteen times the apparent size of the sun, shining almost continually in the midst of the skies; before he can be convinced of the truth by ocular demonstration, he will have to take a journey towards this side. And, should he come as far round *his* world as to that place to which this said luminary world is vertical, at the time when we have new moon, he will see it apparently *thirteen* times as large as the full moon appears to us. Not always tenaciously keeping the same side towards him, or rising or setting, as the moon does to us, but presenting all its sides in the course of 24 hours, 50 minutes, 28 seconds of our time, and never is long itself in

obscurity for almost fourteen of our days, and even when most obscured, presenting a luminous ring, occasioned by our 18 degrees of twilight; or a beautiful crescent on one side, on account of the angle made by the plane of the orbits.

Nevertheless, during the above period, or in the time of the former half of our lunations, this luminary will wane like the full moon. After about seven of its revolutions, only one half of its enlightened disc will be seen; and when about fourteen are completed, it will be at change—exhibiting only the luminous ring or crescent. After which, it will appear horned, in some respects not unlike the new one, and will wane for about some fourteen revolutions more, when it will be again circular and at full. The Lunarian's full moon is therefore our change; and their change is our full.—*Taylor's "Key to the Knowledge of Nature."*

SIR WILLIAM HERSCHELL'S THEORY OF THE UNIVERSE.

With the assistance of his greatly improved telescopes, Herschell examined every part of the milky way, and found its brightness to be caused by multitudes of stars at too great a distance to be seen by the naked eye. He ascertained that it is a large shoal or stratum of stars, with some minor branches. These stars, it is conjectured, are all, or most of them, suns, similar as to magnitude, and other circumstances, to the sun at the centre of our system; so that were our sun viewed from

any other part of the milky way, he would appear only as a small star among the rest.

He further discovered, that all the stars of the universe are in clusters. The extent of a cluster may be guessed at from his considering the shoal of the milky way as one cluster, whose extent, in one direction from the place where we are situated, is not less than 900 times the distance of Sirius, but, in the opposite direction, considerably less; so that we are situated at a great distance from its centre.

He supposed our situation in this cluster to be about four stars deep in the main shoal, near where a minor stratum branches out. At right angles to the most extended direction, the cluster is comparatively narrow; so that when the sky is examined in these directions, that is, out of the sides of the milky way, the bottom of it appears free from telescopic stars, and to the naked eye assumes a bright blue. Now, from the circumstance of the milky way nearly surrounding us, but not entirely so, it is reasonably concluded, that we live near the outside of our cluster, perhaps fifty stars from the nearest point, while the naked eye can only reach all round as far as seven; consequently, without the help of glasses, we could have had no conception of the extent of our cluster, much less of the existence of others quite as large.

The telescope with which Sir W. Herschell examined some of these clusters, enabled him to see 6000 times further than can be seen with the naked eye, or as far as stars of the 42,000th magnitude; consequently, he and others have discovered not less than 2500 clusters. Yet, compara-

tively speaking, but a small part of the heavens have been examined; for, on account of various circumstances which he enumerates, his large forty feet telescope could not be effectively used more than 100 hours in a year; and allowing only a moment for each place, it would require 598 years to sweep the skies. However, the heavens are now divided into zones or portions, and each party of astronomers, in different countries, has its own portion assigned; so that this work of searching, or, as it is called, *gauging* the skies, proceeds apace.

These clusters, when viewed with telescopes of smaller power, present the appearance of luminous clouds, or small patches of the milky way; hence they have got the general term of *nebula*. Though these *nebulæ*, when examined with telescopes of greater power, generally resolve themselves into myriads of small stars; yet it is not always the case. For in some parts of them are luminous places apparently of aëriform matter, that seems to be on the point of assuming a cometary form; each bright spot consisting of a nucleus, with a vast luminous envelope. The most remarkable of these is in the great nebula of Orion (of course in our cluster), and is not farther distant than stars of the seventh or eighth magnitude, and some of it may be as near as stars of the second and third magnitude. This nebula, during the thirty-seven years Herschel made observations upon it, underwent great alteration. Similar changes, though in a smaller degree, have been observed in others.

It was the opinion of this great man, that, by the power which he calls the clustering power,

the same as the attraction of gravitation, all the stars of a cluster have a tendency to draw nearer to each other, though not to one common centre, but to the formation of smaller clusters. Some clusters that he examined are twice as much condensed as our cluster; but even in it, he says it is not difficult to point out the commencement of 200 or 300 smaller clusters. Hence there is ground for conjecture, that now and then it may be necessary for the great Architect, who builds and keeps the whole in repair, to annihilate particular stars that approach too near to others, for the preservation of the whole; just as a well regulated government removes a notorious offender against the general safety: And that, after many ages, they may all rush into a heap. "When the heavens shall pass away with a great noise, and the elements shall melt with fervent heat; the earth also, and the works that are therein, shall be burnt up."

From all this it is evident, that our sun may be as insignificant a star as the least we can see; and that to an eye which could grasp the whole in one view, it might, with its worlds, be annihilated, without its making a greater chasm in the universe, than would be made in a large forest, were we to deprive any one tree of a single leaf.

As the stars of the universe are formed into clusters, each star having planets revolving round it, and almost each planet its satellites, besides comets in all directions, and as the stars in each cluster are presumed to have an internal motion among themselves,—there is reason to suppose that each cluster may have some kind of a planetary motion round some centre of its own, where

the great Ruler of the whole may have a more peculiar mansion: so that as the sun in the centre of our system seems to be stationary, reigning in the full majesty of splendour, and beholding the earth and the other planets with their satellites, as well as the blazing comet encircle its throne; so may the King of systems reign in the midst of this fountain of glory, and behold each cluster containing millions of suns, with their worlds, encircle His throne; and as we are assured the eternal Creator's works are infinite, the throne of his most exalted glory may not rest here; but this system of clusters may be only secondary to another, as much greater in comparison, as this is greater than our solar system; and thus the scale of being may rise in infinity.—*Taylor's "Key to the Knowledge of Nature."*

METEOROLOGY.

LIGHT—ITS LAWS.

THE real nature of light, is one of those subjects which Philosophy has yet to explain; although it is one on which the most able and acute of her cultivators has bestowed a great deal of attention. Sir Isaac Newton demonstrated all its mechanical laws; but as chemistry was in his day only in its infancy, and as the origin of light is undoubtedly among the electro-chemical principles, we need not wonder if that great man left this subject nearly as he found it. The sun is no doubt the great fountain of light; but to the atmosphere we are

indebted for the full blaze of day; for, was it not for the agency of the atmosphere, we should see the sun but as a bright spot, and, when we turned our backs towards him, should be in total darkness; just as when we look at the sun and the contrary way, through a piece of smoked or stained glass.

However, it is the mechanical properties of light which we have now to examine; and these are as plain and demonstrable as any other mathematical subject. The most obvious of them are, that light is transmitted in straight lines from the sun; and that it travels at the rate of nearly 200,000 miles in a second of time. Some idea of the amazing swiftness of its progress may be conceived from the consideration, that it performs the journey from the sun to the earth in little more than eight minutes; but that a cannon-ball, projected from the sun, and travelling at the usual velocity given by gun-powder, would not reach the earth in thirty years.

If light, then, consist of particles, how infinitely small must they be; coming with such velocity, and entering the eye, the most delicate and sensible organ of the body, without causing any great degree of uneasiness! "If a particle," says Thompson, in his Elements of Chemistry, "weighed a thousandth part of a grain, its force would be equal to that of a musket-ball; were it the millionth part of a grain, it would destroy every thing against which it struck. If it weighed a millionth part of that, it would still have a very sensible force; but how much less must it be, when it makes no impression upon an organ so very delicate as the eye? We are certain, then, that no

particle of light can weigh a million millionth part of a grain."

When light proceeds in every direction from a luminous body, as from a candle, its intensity is diminished as the square of its distance; thus, if the intensity at a certain distance be one, then, at twice that distance, it is only one-fourth; at thrice, one-ninth, and so on.

The rays of light, while passing through the same medium, are *rectilineal;* but on entering a different medium, they are directed from the straight line, and are said to be *refracted.* When they strike a body, which neither permits them to pass through it, nor yet to enter, so as to be absorbed, they rebound from it, and are then said to be *reflected.*

Rays of light are said to be *parallel, converging,* or *diverging.* As all move in straight lines, those are *parallel* which do not in any part approach nearer to, or recede farther from, each other. *Converging* rays are such as meet in a point, which is called the focus; and they are said to diverge, when they separate from a point or focus.

The rays of light always diverge from the focus at which they are generated; consequently, the rays of the sun, being under this law, diverge accordingly; but, because the sun is a million times larger than the earth, and at the distance of ninety-five millions of miles, the divergency of those comparatively few rays that strike the earth, is so very small, that they are always considered as parallel.

As pieces of glass can be fashioned with every variety of surface, by their assistance, and that of

bright and polished surfaces, opticians can refract, unravel, reflect, condense, and disperse the rays of light, almost in any manner they please.—*Taylor's "Key to the Knowledge of Nature."*

THE FATA MORGANA.

Of all the phenomena of nature, there is none which visits the mind with such indescribable emotion, as that which animates every beholder of the fata morgana, in the Straits of Messina,—a phenomenon that exceeds all the fairy phantoms which the imagination creates while we are reading the brilliant descriptions of Arabian poets. The Sicilians call it the most beautiful sight in nature. Minai has written a dissertation on this phenomenon, which is thus described by Father Angelucci. "On the 15th of August, as I stood at my window, I was surprised with a wonderful vision. The sea that washes the Sicilian shore, swelled up, and became, for ten miles in length, like a chain of dark mountains; while the waters near our Calabrian coast grew quite smooth, or in an instant appeared as one clear polished mirror, reclining against the ridge. On this glass was depicted, in chiaroscuro, a string of several thousand pilasters, all equal in altitude, distance, and degree of light and shade. In a moment they lost their height, and bent into arcades like Roman aqueducts; and a long cornice was next formed on the top, and above it rose castles innumerable, all perfectly alike. They soon split into towers, which were shortly after lost in colonnades, then win-

dows, and at last ended in pines, cypresses, and other trees, even and similar. This is the fata morgana which for twenty-six years I thought a mere fable." Such is the account of this astonishing phenomenon, derived by Swinburne from Father Angelucci.—*Bucke's Beauties, Harmonies, and Sublimities of Nature.*

Verney, says St Pierre, was one day greatly surprised to perceive in the sky the appearance of a town turned upside down, and to distinguish perfectly the steeples, towers, and houses. He lost no time in sketching this phenomenon, and determined on ascertaining its cause; he proceeded, following the same point of the compass, into the mountains. But how great was his surprise on finding, at a distance of seven leagues from the spot, the town of which he had seen the reflection in the sky, and of which he had taken a sketch in his portfolio. One of those very curious and singular atmospherial phenomena, which are occasionally seen among the Hartz mountains in Hanover, and have once or twice been observed in Souta Fell in Cumberland, has been seen in Huntingdonshire. About half-past four o'clock on Sunday morning, July 16, 1820, the sun was shining in a cloudless sky, and the light vapours arising from the river Ouse were hovering over a little hill near St Neots; when suddenly the village of great Paxton, its farm-houses, barns, dispersed cottages, trees, and its different grass-fields, were clearly and distinctly visible in a beautiful aërial picture, which extended from east to west about 400 yards. Nothing could exceed the astonishment and admiration of the spectator, as he looked at this surprising phenomenon from a gentle de-

clivity, in an opposite direction, at the distance of half a mile, or his regret at its disappearance in about ten minutes.—*Cambridge Journal.*

CURIOUS INSTANCE OF ATMOSPHERICAL REFRACTION.

THERE is a singular instance of atmospherical refraction recorded in the Philosophical Transactions, by William Latham, Esq., who, when living at Hastings, was surprised by seeing a vast number of people hurrying down to the sea-side. Upon inquiring the reason, he was informed that the coast of France was plainly to be distinguished with the naked eye. He, therefore, went down immediately, and found that, without the aid of a telescope, he could plainly perceive the cliffs on the opposite coast; which are at least between forty and fifty miles distant, and not at other times to be discovered with the best glasses. They now appeared to be only a few miles off, and extended some leagues along the coast. He walked along the shore eastward, by the waterside, conversing with the sailors and fishermen on the subject. They could not, at first, be persuaded of the reality of the appearance; but soon became so thoroughly convinced, by the cliffs gradually appearing more elevated, and approaching nearer, as it were, that they pointed out and named the different places they had been accustomed to visit—such as the Bay, the Old Head, or Man, the windmill, &c. at Boulogne, St Vallery, and other places on the coast of Picardy; which they after-

wards confirmed when they viewed them through their telescopes. They also observed the places appeared as near as if they were sailing at a small distance into the harbours.

Having remained on the shore nearly an hour, during which time the cliffs appeared to be at some times more bright and near, at others more faint, and at a greater distance, but never out of sight, he went on the eastern cliff, or hill, which is of a very considerable height, and from thence a very beautiful scene presented itself. Dergeness, the Dover cliffs, the French coast from Calais, Boulogne, &c. to St Vallery, and, as some of the fishermen affirmed, as far to the westward even as Dieppe, were visible. By the telescopes, the French fishing-boats were plainly to be seen at anchor; and the different colours of the land on the heights with the buildings were perfectly discernible. This curious phenomenon continued in the highest splendour till half past eight o'clock, when a black cloud obscured the face of the sun for some time, and it gradually vanished. At Winchelsea, and several places along the coast, it was equally visible. The weather had been remarkably fine and clear, not a breath of wind was stirring the whole of the day; but the small pennons at the mast-heads of the fishing-boats in the harbour, were in the morning at all points of the compass.—*Philosophical Transactions.*

THE MIRAGE.

HERE, at the village of Utko, we procured asses

for our party, and, setting out for Rosetta, began to recross the desert, appearing like an ocean of sand, but flatter and firmer as to its surface than before. The Arabs, uttering their harsh guttural language, ran chattering by the side of our asses; until some of them calling out "*Raschid!*" we perceived its domes and turrets, apparently upon the opposite side of an immense lake or sea, that covered all the intervening space between us and the city. Not having in my own mind at the time any doubts as to the certainty of its being water, and seeing the tall minarets and buildings of Rosetta, with all its groves of dates and sycamores, as perfectly reflected by it as by a mirror, insomuch, that even the minutest detail of the architecture, and of the trees, might have been thence delineated, I applied to the Arabs, to be informed in what manner we were to pass the water. Our interpreter, although a Greek, and, therefore, likely to have been informed of such a phenomenon, was as fully convinced as any of us, that we were drawing near to the water's edge, and became indignant, when the Arabs maintained, that within an hour we should reach Rosetta, by crossing the sands in the direct line we then pursued, and that there was no water. "What!" said he, giving way to his impatience, "do you suppose me an idiot, to be persuaded contrary to the evidence of my senses?" The Arabs smiling, soon pacified him, and completely astonished the whole party, by desiring us to look back at the desert we had already passed, where we beheld a precisely similar appearance. It was, in fact, *the mirage*, a prodigy to which every one of us were then strangers, although it afterwards became more familiar. Yet

upon no future occasion did we ever behold this extraordinary illusion so marvellously displayed. The view of it afforded us ideas of the horrible despondency to which travellers must sometimes be exposed, who, in traversing the interminable desert, destitute of water, and perishing with thirst, have sometimes this deceitful prospect before their eyes.*—*Dr Clarke's Travels.*

THE WIND.

Wind has been explained in the following manner:—Heated air has a tendency to rise, and cold air rushes in to supply its place. Thus the heated air of the equatorial regions rises, and gives place to a current from the polar regions, which is a process that serves to equalize the temperature of the world. But the polar countries lying near to the axis of the sphere, the air from those regions has not received so much motion as that about the equator, or greatest distance from the axis; wherefore, it arrives at the equator, where the motion of the earth is greater. If it had no motion before, an east wind would be the consequence, and the force of that wind would be as the difference between the motion of the earth where the air came from, and that where it arrived; but then it has a motion to the south; for it is rushing into a va-

* This appearance is often seen, when the sun shines upon the extensive flat sand on the shores of the Bristol Channel, in Somersetshire, and probably on the sea-shore in other parts of England; the cause is, we believe, the evaporation of water.

cuum left by the air which rises: so that the wind will not be from the east, but north-east; and the number of degrees north of the east from which it will blow will depend upon the comparative force of the current of air from the north to the difference between the earth's motion at the equator and at the polar region, from whence the air comes. As there must be a corresponding efflux from the equator higher up; according to this theory, the wind should everywhere be north-east or south-west, but it blows in very different directions at different times and places; and this probably depends on the variations in temperature at different times and places.—*Forster's "Researches about Atmospheric Phenomena."*

IRREGULAR WINDS.

THE winds are more irregular on the land than on the sea, and in high than in low countries. The mountains not only change the direction of the winds, but even produce some, which are either constant or variable, according to their causes. The melting of snows on the tops of the mountains, generally give rise to constant winds, which last a considerable time. The vapours which strike against the mountains, and accumulate upon them, produce variable winds, which are very common in all climates; and there is as great a variety in the motions of the air, as there are inequalities on the surface of the earth. We can only, therefore, give examples, and a genuine history of facts. And, as a connected series of observations upon

the variations of the winds, and even of the seasons, in different countries, is still wanting, we shall not attempt to explain all the causes of these variations, but shall confine ourselves to those that are most probable.

In straits, at the extremities of promontories, peninsulas, and capes, and in all narrow bays, tempestuous winds are frequent. But, independent of these, some seas are much more infested with storms than others. The Indian Ocean, the seas of Japan and of Magellan, along the African coast, beyond the Canaries, and the opposite coast near Natal, and the Red and Vermilion Seas, are all subject to tempests. The Atlantic is likewise more tempestuous than the great ocean called the Pacific. This ocean, however, is nowhere perfectly tranquil but between the tropics; for, the nearer we approach the poles, it is the more subject to variable winds, the sudden changes of which produce tempests.

All continents are subject to the effects of variable winds, which are sometimes very singular. In the kingdom of Cassimir, which is surrounded with the mountains of Caucasus, a most sudden reverse of seasons is felt on Mount Pirepenjale. In less than an hour's journey, we pass from summer to winter. A north and a south wind, according to Bernier, blow perceptibly within 200 paces of each other. The position of this mountain must be singular, and therefore it merits a particular examination. In the peninsula of India, which is traversed from north to south by the mountains of Gate, the extreme heats of summer are felt on one side of those mountains, and all

the rigours of winter on the other. The same phenomenon takes place on the two opposite coasts of Cape Rosalgate, in Arabia. On the north coast, the sea is calm and tranquil; while the south coast is infested with continual storms. Ceylon exhibits another example of this phenomenon. Winter and high winds reign in the north part of the island, while, on the south side of it, fine weather and summer heats prevail. Of opposite seasons in the neighbourhood of each other, and at the same time, there are several examples, not only on the continent, but on the islands; as at Cerem, a long island near Amboyna, in the north part of which it is winter, and summer in the south part; and the interval between these two seasons is not above three or four leagues.

In Egypt a south wind prevails in summer, which is so hot as to stop respiration; and it raises such immense quantities of sand, that the sky seems to be covered with thick clouds. This sand is so fine, and is blown with such violence, that it penetrates the closest chests. When these winds continue for several days, they give rise to epidemic diseases, which frequently cut off vast numbers of men. It seldom rains in Egypt; every year, however, there are some days of rain in the months of December, January, and February. But thick fogs are more frequent than rain, especially in the neighbourhood of Cairo. These fogs commence in November, and continue during the winter; and, through the whole year, even when the sky is serene, the dews fall so copiously, that they have all the effects of rain.

In Persia, the winter commences in November, and lasts till March. The cold is strong enough

to produce ice ; and snows fall in the mountains, and sometimes in the plains. From March to May they have violent winds, which recal the warmth of summer. From May to September the sky is serene, and the heats are moderated during the night by fresh breezes, which continue till morning ; and in autumn, they have violent winds like those which blow in the spring. However, though those winds are very strong, they seldom produce tempests or hurricanes. But in summer a very noxious wind blows along the Persic Gulf, which is called *Samiel* by the natives ; it is still hotter and more terrible than that of Egypt ; and, acting like an explosion of inflamed vapour, it suffocates every person who unhappily falls within its vortex. A similar wind rises in summer along the Red Sea, which suffocates animals, and transports such quantities of sand, that many people imagine this sea will, in the course of time, be completely filled up with it. Arabia gives birth to frequent clouds of sand, which darken the air, and excite dangerous whirlwinds. At Vera Cruz, when the hot winds blow from the north, the houses of that town are almost buried with sand. Hot winds are also felt in summer at Negapatan in India, and likewise at Petapouli and Masulapatan. These scorching winds, which kill men, are fortunately of no long duration ; but they are extremely violent, and their heat and deleterious quality are proportioned to their velocity, which is contrary to the nature of other winds ; for the more their rapidity, they are more wholesome and refreshing. This difference proceeds from the degree of heat in the air. When the heat of the air is less than that of the body, the motion of the air is agree-

able. But, when the heat of the air is greater than that of the bodies of animals, its motion scorches and suffocates. At Goa, the winter, or rather the rainy and tempestuous season, is in the months of May, June, and July; it cools and refreshes the air, which would otherwise be perfectly insupportable in that region.

The Cape of Good Hope is famous for its tempests, and a peculiar cloud which produces them. This cloud, at first, appears like a small round spot in the heavens, which mariners distinguish by the name of the *ox's eye*. The seeming smallness of this cloud is probably owing to its great height.

The navigators who first approached the Cape of Good Hope, were ignorant of the effects of these clouds, which seemed to arise slowly, and without any agitation in the air, but which, in a moment, excite the most furious tempests, and precipitate the largest vessels to the bottom of the ocean. In the country of Natal, a cloud similar to the ox's eye at the Cape, produces the same direful effects. These species of tempests are frequent in the Atlantic, especially in the neighbourhood of the equator. Near the coast of Guinea, three or four of these storms sometimes happen in a day, which are likewise occasioned and announced by small black clouds, while the rest of the sky is generally serene, and the sea perfectly calm. It is principally in April, May, and June, that these furious storms arise along the coast of Guinea, because no regular winds blow at that season.

All these storms originate from winds that issue from a cloud, and their direction is from north to

south, or from north-east to south-west, &c. But there are tempests of another kind, called whirlwinds, which are still more violent, and in which the wind seems to blow from every quarter at once. Their motion is circular, and nothing can resist their fury. They are generally preceded by a dead calm; but, in an instant, the waves are elevated to the clouds by the fury of the winds. Some parts of the sea cannot be approached, because they are perpetually infested either with calms or whirlwinds. These places have been called *calms* and *tornados* by the Spaniards. The most considerable of them are near Guinea, about the second or third degree of north latitude. They extend about 300 or 350 leagues in length, and nearly as much in breadth, which includes a space of more than 100,000 square leagues.—*Buffon's Natural History.*

THE SIMOOM.

This phenomenon seems to be akin to our whirlwinds, and is a column of the positive electric fluid moving from the S. or SE. northward, and is so concentrated, that it is almost sure death to those who breathe the baleful air it moves in. When its terrific form glides across the desert, there is no means of avoiding it, since it moves nearly as quick as lightning. The only chance of escaping it is, for the traveller to throw himself flat on his face, which he has not always time to do. But Bruce's ardent mind was not to be diverted from the attainment of knowledge, by the

presence of danger. On the attendants calling out that the Simoom was coming, he immediately turned for a moment to the quarter whence it came. It resembled a haze, in colour like the purple part of the rainbow, but not so compressed or thick. It was a kind of blush upon the air, and was about twenty yards in breadth, and about four from the ground. Its motion was so rapid, that before he could turn and fall upon the ground, he felt its violent heat upon his face. It passed like a gentle rustling wind, but was succeeded by a slight breeze, which for two or three hours was of such intensity of heat, as nearly to suffocate them. Bruce unfortunately inhaled a little of the purple haze, which nearly deprived him of his voice, and caused an asthma of two years continuance. They saw it twice afterwards as they journeyed across the Desert. The second time, it was more southerly, its edges were less defined, resembling a thin smoke, and it had about a yard in the middle tinged with purple and blue. The third time, it had the same purple and blue appearance, but was preceded by the largest sand pillar they had seen.—*Taylor's "Key to the Knowledge of Nature."*

PILLARS OF SAND.

We saw a number of prodigious pillars of sand at different distances, at times moving with great celerity, at others, stalking with majestic slowness. At intervals we thought they were coming in a very few minutes to overwhelm us, and small quantities of sand did more than once actually reach us.

Again, they would retreat, so as to be almost out of sight, their tops reaching to the very clouds. There the tops often separated from the bodies; and these once disjointed, dispersed, and did not once appear again. Sometimes they were broken near the middle, as if struck by a large cannon shot. About noon, they began to advance with considerable swiftness upon us, the wind being very strong at north. Eleven of them ranged themselves along side of us, at about the distance of three miles The greatest diameter of the largest appeared to me at that distance as if it would measure about ten feet. They retired from us with a wind at south-east. But before four o'clock in the afternoon, these phantoms of the plain had all of them fallen to the ground and disappeared. Two days after this, the same appearance of moving pillars of sand presented themselves, only they seemed to be more in number and less in size. They came several times in a direction close upon us, that is, I believe, within less than two miles. They rose immediately after sunrise like a thick wood, and almost darkened the sun; his rays shining through them for near an hour, gave them the appearance of fire. Our people now became desperate, the Greeks shrieked out, and said it was the day of judgment. Ismael pronounced it to be hell, and the Tucorories (the name of the people who had joined us), that the world was on fire. I asked Idris if he had ever before seen such a sight. He said often seen them as terrible, though never worse; but what he feared most was that extreme redness in the air, which was a sure presage of the coming of the simoom.—*Bruce's Travels.*

HAIL.

HAIL is merely frozen rain; and the only difficulty in its natural history is, to account for its congelation. All the great falls of hail have been attended by thunder and lightning; and on all occasions, when there is hail, there is a great conflict among the clouds, so that we consider hail, in some degree, as the produce of the same aërial or electric process as that of waterspouts. In this manner, the vapours are kept suspended by the intensity of the electric charge and the whirling motion, with a much greater degree of density than they ever have in clouds; and are also, by the conflict caused by the combining electricities, carried into more elevated regions than the cumulo clouds ever ascend to, and thus enter the regions of perpetual congelation; so that they are there solidified into those icy masses, of which natural historians give many surprising accounts.

In Italy, 1210, there fell a shower of hailstones of enormous size, some of them weighing an hundred pounds. It was attended with a strong smell of sulphur, and the stones were of a bluish colour. Another fell at Lisle, 1786, of a large size, some of them in the middle contained a brown substance, which exploded in the fire. April 29th, 1697, a large black cloud from Caernarvonshire, passed over Cheshire and Lancashire, which threw down hailstones of half a pound weight. Its tract was sixty miles in length, and two in width. May 4th, in the same year, a shower fell in Hertford-

shire, whrein were stones of fourteen inches in circumference. They killed several persons. But there are records of masses of ice that have been precipitated from the atsmosphere, or thrown down by waterspouts.—*Taylor's "Key to the Knowledge of Nature."*

THEORY OF SOUND—THE HUMAN EAR.

AMONG the numberless advantages derived from the elasticity of air is that of sound; which is nothing more than the air put in motion by sudden or violent jerks and pressures. These give rise to propulsions or vibrations, that move somewhat in the same manner as the undulations seen in water, when we throw a stone into it. But in air they are much more pungent and decisive, on account of the great velocity with which they move.

The sensation of sound is caused by these vibrations extending themselves to the air that occupies the internal parts of the ear, and giving motion to the instruments therein placed, which are more curiously contrived, so as to produce certain effects on the auditory nerves. During winds the air moves in streams, or a portion of the atmosphere changes its place; in sound it moves without changing place. The velocity of the swiftest wind, in this quarter of the globe, seldom exceeds 50 or 60 miles per hour; while the propulsions that produce sound move at the rate of 778½ miles. Was the quantity of air, which was put in motion

during a wind, to move with the velocity of sound, not to mention the general destruction of nature, our ears would be forever disabled by the blast. A cannon ball moves nearly with the same velocity as sound; and hence engineers and others have frequently lost their hearing, by their heads coming in contact with the air struck by the firing of large guns, or the passage of balls; the extent of the vibration at the focus being so much greater than it is at a distance.

That sound depends upon the air, may be proved by a bell suspended in the exhausted receiver of an air-pump, when, however struck, it will emit no sound. Aeronauts, when at great elevations, can hardly hear themselves speak; and a pistol fired in these upper regions makes very little report. It is chiefly, therefore, to the density of the atmosphere, that we owe the origin of sound. However, the atmosphere is not the sole medium of sound. It may be propagated in water, as may be proved by ringing a bell in it, which will emit a sound one fourth more loud and shrill than when rung in air. Fish, as is very well known, have the sense of hearing very acutely at the greatest depths. Sound is also capable of being transmitted through solid bodies, and that to a certain degree with greater velocity than through air.

The distance to which sound may be heard through the air depends on a variety of circumstances. In calm serene weather, when every thing is quiet, and the barometer is high, sound is much stronger, and is heard from a much greater distance, than under the opposite circumstances. It is heard further over a smooth surface and still water, than over a rough uneven surface, beset

with trees and other objects, or over agitated water. Under favourable circumstances, St Paul's clock has been heard to Windsor. An instance is related of the human voice having been heard ten miles. An ordinary musket cannot be heard above seven or eight miles; but the discharging of several, not simultaneously, but following each other very closely, may be heard from a much greater distance. It has been said, that, in the Dutch war of 1672, the reports of cannons were heard at the distance of more than 200 miles. The principle on which hearing-trumpets act is this:—Their wide end, being directed to the place whence the sound issues, collects and condenses the vibrations of the air, and transmits them into the ear. In short, if we examine the human ear, we shall find the hearing-trumpet but a clumsy imitation of it. It may, therefore, be considered as an elongation of the external ear, and man frequently performs its office by the application of his hand. We also see all animals, in the act of listening, turn the orifice of the ear towards the sound—stretching it open, to collect as wide a portion of the waves as possible.

The well-known whispering gallery in the dome of St Paul's is the inside of a hemisphere, so that if the mouth be placed at one side, and the ear diametrically opposite on the other, the gentlest whisper may be heard as distinctly as if the mouth and the ear were both together. For at the place where the ear is situated are all the waves collected into a focus—it being the place where, according to mathematical rules, all the lines of reflection will meet from the places where the lines of incidence impinge upon all parts of the hemisphe-

rical cupola, as well as the wave that travels diametrically across to the ear. But should the ear not be diametrically opposite the mouth, the words will be heard doubly or confusedly, since the waves, coming directly or along the shortest arcs, will arrive sooner at the ear, than those that make the circuit of the longest.

All sound, whether it be a gentle whisper, or the dreadful report of the cannon, travels with the same velocity; viz. 1142 feet per second, or about 13 miles per minute; but when its motion is against the wind, it is slower; and when with the wind, it is quicker. In the former case, the velocity of the wind, must be added, and in the latter it must be subtracted. The transmission of sound has therefore been applied to ascertain the distance of objects. But this can only be done when we can see the act that produces the sound, as, in the case of firing a gun, we see the flash. Light, from its quick transmission, is considered as instantaneous in its passage; and, therefore, we suppose the flash to be seen at the same instant in both places. Suppose, then, a gun be fired from a ship in distress at sea, the sound will not be heard for some time after the flash is seen. Should we count the intervening seconds by a watch, and multiply them by 1142, the number of feet that sound moves in a second, it will give the distance of the ship. Or, seeing a cannon fired at a certain place, at a known distance, whence the wind blows direct, then the time in which the sound arrives, subtracted from the time in which it would arrive in a calm, will show the velocity of the wind.

The time occupied in the transmission of sound accounts for the continued rumbling noise of thun-

der. For though a peal continue twenty seconds, it is but one clap as instantaneous as the crack of a pistol. Suppose a flash of lightning extend four miles along a thunder cloud. This flash, as may be seen by the eye, is simultaneous from end to end; and is, by the sudden vibration it gives to the air, the cause of the sound we call *thunder*. A person, stationed directly under one end of the flash, will see the whole chain exactly at the same instant. Suppose the cloud 380 yards high, he will hear the report or commencement of the thunder just one second after he has seen the flash. But as the other end of the report is four miles from him, it will be more than eighteen seconds before the sound reach his ear; yet, during the interval the vibrations from the intervening part have been entering his ear, preserving the continuity of sound or the rolling of thunder. Should he be placed about half way between the two ends, he will hear the thunder peal, as it were, separate into two branches; the sound coming from each side at the same time, but it will be of only half the duration.—*Taylor's "Key to the Knowledge of Nature."*

THE WEATHER—PROGNOSTICS OF ATMOSPHERIC CHANGES.

THE popular prognostics of rain, wind, and other changes of weather, which, with little variety, are common in most countries, seem to have been known and observed with accuracy of old. Indeed, their being familiar to almost every age and coun-

try, affords the strongest confirmation of their correctness to those who have not had constant experience of them. Although we find familiar mention of the signs of the weather among almost all the oriental writings; yet Theophrastus, the Grecian naturalist, seems to have been the first who cultivated this branch of meteorological science, and collected together the proverbial rules of judging of the weather; which were shortly afterwards put into verse by Aratus the poet in his Διοσημεια, above two thousand one hundred years ago, and are imitated by Virgil, Lucan, Pliny, Seneca, and others. With little variation, the same rules are found scattered among numerous works of natural history and science. And they are popular among the lower classes of modern Europe. Such of them as I have collected by occasional conversation with persons who spend their lives chiefly out of doors, and who are attentive in noticing their prognostics, or what I have noticed myself, I have here collated, with the written accounts of the ancients.

Section I.—*Of Prognostics of Atmospheric Changes, deducible from the motions of Animals.*

It was long ago observed by the ancients, that from the peculiar motions and habits of many animals, the consequence, probably, of their sensations of pain or of pleasure, a very accurate judgment might be formed of the approaching changes of the weather; neither has this entirely escaped the notice of more modern meteorologists. But I think they have not bestowed that share of attention to this subject which it certainly deserves. It is dif-

ficult, perhaps, to conceive the manner in which animals become sensible of the approach of particular kinds of weather. We cannot suppose that they are forewarned of it by the appearances of the sky, at least in many cases; for some animals express signs of uneasiness previous to an alteration of the weather, long before there are any visible signs of change, and often when they have no opportunity of observing what is going on abroad. Dogs, for instance, closely confined in a room, frequently become very drowsy and stupid before rain. They often sleep all day before the fire, and are almost incapable of being roused. The same in a less degree is observable in cats. And a leech, confined in a glass of water, has been found by its rapid motions, or its quiescence, to indicate wet or fair weather. From an examination of the structures of the brain of animals, they do not appear organized to have any notions of causation; but they observe that two things are together, or follow one another; thus, from one they anticipate and prepare against another. Their prognostication, however, of weather, seems to result rather from some impressions on their feelings, than from any observation of what is going on in the sky. Peculiarities in the electric state of the atmosphere may, I think, be supposed to affect the constitutions of animals, in the same manner as they appear to do ours, and may thereby excite pleasureable or uneasy sensations.

Rain may be expected when the swallow flies low, and skims backward and forward over the surface of the earth and waters, frequently dipping the tips of its wings into the latter.

When bees do not go out as usual, but keep in

or near to their hives, or when ducks, geese, and other water-fowl, are unusually clamorous, we may also expect wet.

Before rain, swine as well as poultry appear very uneasy, and rub in the dust.

Before and during rain, ducks, geese, and other fowls, wash and dive in the waters more than usual. Pigeons also wash before rain, and cats wash their faces; they have been observed also to scratch the bark off trees. In autumn, flies sting and become unusually troublesome.

Dogs, and other domestic animals, likewise express signs of uneasiness, and are very sleepy and dull before rain or snow. Dogs are said to dig great holes in the ground in rainy weather. We had a dog always busy in digging deep caverns in the earth which he laid in during particular kinds of weather. This dog was a cross breed between a pug and a terrier, remarkable for his sagacity.

If abroad, after long continued dry weather, when the sky is thickening, and rain approaching, we may frequently observe the cattle stretching out their necks, and snuffing in the air with distended nostrils; and often, before storms, assembled in a corner of the field, with their heads to the leeward.

The loud and continued croaking of frogs heard from the pool, the squalling of the pintado and the peacock, and the appearance of spiders crawling on the wall more than ordinary, and the coming forth of worms, have also been considered as signs of rain. Most of these have been noticed by Virgil, who has likewise added several more, which have never fallen under my notice, but which have been mentioned by many writers, both ancient and

modern. When cocks crow at uncommon hours, and clap their wings a great deal, it is said to be a sign of rain, as is the appearance of the redbreast near houses.

Sparrows chirp particularly loud during rain, and often begin before it falls, affording thereby, for some time previously, a prognostick of its coming.

If toads come from their holes in great numbers; if moles throw up the earth more than usual; if bats squeak or enter the houses; if asses shake their ears and bray much; if hogs shake and destroy the corn-stalks; if oxen lick their fore feet, or lay on their right side; or if mice contend together or squeak much, according to many authors, we may expect rain. Sheep and other cattle gamboling or running about, and appearing very uneasy, also portend rain.

Sometimes previous to rain, sheep and goats seem more desirous to graze, and quit with reluctance their pastures.

Among other things, the activity of ants in carrying about their eggs, the voice of the solitary crow, and the frequent immersion of many waterfowl, have been considered as indications of rain. The garrulity of crows, ravens, rooks, and other birds of this sort, is indeed well known; "corvus aquat" is a proverb cited by Erasmus. But we must distinguish between the voice of the raven before rain, perched solitary on a tree and uttering a harsh cry, from his deep and peculiarly modulated voice when sailing round and round, high up in the air, before and during severe weather. The raven, as well as other birds, often soars at an elevation much beyond what we are apt to

imagine. When at the top of Cader Idris, near Dolgelly, I observed these birds flying considerably above the summit of that mountain, on which I sat.

The hooting and screeching of owls often indicates a change of weather. They hoot in fact during variable weather; when fair is about to be changed for wet, or wet for fair, a similar disturbance of their feelings from atmospherical causes probably makes them hoot. Refer to Virgil's observation in Georg. lib. i., and Professor Heyne's Note on them. Authors have added, the snapping of the flame of a candle or lamp, mentioned by Aratus and Virgil, as a sign of wet.

The missile thrush, *turdus viscivorus*, frequently sings particularly loud and long before rain. I have known this bird sing throughout a severe storm. It is, from this circumstance, called the storm-fowl.

Mariners at sea expect a storm when the *procellariæ pelagicæ*, or stormy petrels, shelter themselves in numbers under the wake of the vessel.

Pennant observes, that on the island of St Kilda, the *procellaria glacialis* is very useful in foreboding the direction of the wind. When these birds return to the land in numbers, there will be no west wind for a long time; when, on the contrary, they return to the ocean, a west wind is expected. Several prognosticks of storms are mentioned by the old Greek writers, which are not observed on our shores, neither do we know exactly what birds they alluded to. I have observed, that previous to windy weather, pigs seem very uneasy and running about, throwing up their heads, and squeaking.

Magpies, before and during wind, fly about in small companies, and make a fluttering noise.

When the sea-gulls come in numbers to shore, and make a noise about the coast; or when, at sea, they alight on ships, the sailors consider it a sure foreboding of a storm. These circumstances were known of old. Before storms, too, the porpus, dolphin, and grampus, come to the shore in large bodies.

When dolphins play about the surface of a calm sea, Pliny observes, wind may be expected from that quarter from which they have come. Authors have added tame swans, flying against the wind, as a sign of rain.

Section II.—*Of Prognosticks of Weather, taken from the Observance of Plants and Flowers, &c.*

In the economy of nature, we find that plants, like animals, adapt their motions to their wants: some expand their flowers to the sun, and close them at eventide; others expand their flowers in the evening, open before rain, or perform various other functions, the result of their particular natures, and to which the varying states of the atmosphere are specific stimuli. From an accurate and constant observance of these, many prognosticks of the ensuing weather have been deduced; of which I insert the following, rather on account of their popularity, than because I have noticed many of them myself.

Chickweed has been said to be an excellent weather-guide. When the flower expands freely, no rain will fall for many hours; if it so continues, no rain need be feared for a long time. In showery

days the flower appears half concealed, and this state may be regarded as indicative of showery weather; when it is entirely shut, we may expect a rainy day.

If the flowers of the Siberian sowthistle remain open all night, we may expect rain next day.

Before showers, the trefoil contracts its leaves; as does the convolvulus, and many other plants.

Lord Bacon observes, that the trefoil has its stalk more erect against rain.

There are many plants whose flowers are opened at particular periods of the day, as the *tragopogon*, *porrifolium* and *pratense*, which open their flowers earlier or later, according to the state of the weather.

Lord Bacon mentions a small red flower, growing in stubble fields, called by the country-people *wincopipe*, which, if it opens in the morning, ensures us a fine day.

To these the closing of the flowers of the pimpernel, and numerous other prognostics, might be added; but it would swell this section beyond its limits. *

Section III.—*Of the Prognostics of Weather from the Appearances of the Sky.*

After clear weather, the appearance of light streaks of cirrus in the sky, is often the first sign of a change. These increase, descend, become cirrostrati, cumuli form underneath, and inosculate, and nimbus and rain are the event of the process begun by fine filaments of the cirrus.

* The reader may consult Lord Bacon's *Sylva Sylvarum*, cent. ix. cap. 823–830.

When the cirrus is seen in detached tufts, called Mares' Tails, it may be regarded as a sign of wind, which follows often blowing from the quarter to which the fibrous tails have previously pointed. The change from cirrus to cirrostratus, and, indeed, the great prevalence of the latter cloud at any time, must be regarded as an intimation of an impending fall. The most formidable features of cirrostratus, are the large, spreading, and dense sheets of it which veil the sky before rain, and in which the sun often sets shrouded against a rainy day.

The prevalence of clouds of the modification of cirrostratus at eventide, had been noticed as a sign of rain long before the specific nature of the different clouds was attended to; and the vivid colours of red and crimson seen in this cloud when the sun is near the horizon, give rise to many proverbs about the red evening, and its favourable omen to the traveller—a remark, quite as trite among country people, as the grey morning before a fair day. This, as well as the redness of the morning, as indicative of a fair day, is noticed by St Matthew, in chap. xvi. 2. Dappled grey mornings, or those marked by the lofty confluent nubeculæ of cirrocumulus, often usher in a fair, warm day. * Indeed, the appearance of cirrocumulus, in general, indicates an increase of temperature. Heyné, in his edition of Virgil, speaks

* An old proverb reminds us,

An evening red, and a morning grey,
Are sure signs of a fine day.
But an evening grey, and a morning red,
Put on your hat, or you'll wet your head.

The Italians have,

Sera rosa e nigro matino,
Allegra il Pelegrino.

of them as being called Oviculæ, or Little Sheep, from their appearance, and as indicating fair weather. †

The irregular increase of cumuli, particularly towards evening, and, in general, their not subsiding in the evening, may be regarded as a forewarning of wet.

When a dense and uniform veil of cloud covers the sky, as is often the case before rain, with a still air, music and noises are heard a great way off, which has caused the far propagation of sounds to be regarded as a prognostic of rain. The sound of distant church-bells in the country, often serves this prognosticative purpose.

In Wales, the common people say, that when the mountains have their nightcaps on, the rain will soon fall.

While I was in Wales, during a showery time, the peaks of the mountains were generally capped with clouds of the low and nimbiform kind. The clearness of the tops of mountains is, on the contrary, a sign of the fairness of the weather. Long cirrostrati, and other elevated clouds, often alight on the summit of real mounatins, as they do on mountain-like cumulostrati, and are equally indicative of wet weather.

When the rapid formation and disappearance again of clouds take place in fine days, as is often the case, we may suspect the serenity we enjoy,

† Among the many rules, such as are contained in our old Almanacks, we find,

If woolly fleeces strew the heavenly way,
Be sure no rain disturb the summer day.

Virgil and Aratus, however, made the *vellera lanæ* rainy signs, and meant, no doubt, cirrus, or cirrostratus.

and look forward to a change. I have seen little cumuli form and disappear in the space of a few minutes, and cirrus form—change its figure to spots of cirrocumulus, and disappear at the same time at a more elevated station.

Luminous phenomena about the sun by day, or the moon by night, being generally produced by the intervention of cirrostratus, indicate the fall of rain, snow, or hail, according to circumstances. Indeed, many of the signs of rain are likewise, under other circumstances of time of year, &c. prognostics of snow. The halo is one of the most certain signs of rain we have; though I have even known this fail in its accustomed indication. The parhelion, and other peculiar refractions, also forebode rainy weather.

The rainbow, which is only an effect of nimbus, has been regarded as a sign of rain, which it may rightly be; for it often appears in the nimbus before that cloud, weeping in his sable shroud, has reached the spot where we stand; *Bibit ingens arcus*, says the Mantuan bard, who took most of his prognostics from the *Diosemea* of Aratus.

Of the particular indications of the haze in the atmosphere, we may notice, that the mere hazy or pale colour of the moon often forebodes rain, while she is more brazen, red, or copper-coloured, before wind. This corresponds with the red in the clouds, before noticed as a sign of wind.

Section IV.—*Of several other Prognostics of Rain.*

Many indications of atmospheric changes have been noticed by different authors, which I have

not determined by my own observations to be correct; such, for example, as the smell of drains and suspools; the excrescence of fungi about the wicks of candles and lamps; the flaring and snapping of the flame; the soot taking fire in sparks round the smoky outside surface of a pot on the fire; the wicks of candles not being easily lighted; and many others of this sort. Wind has been indicated by candles burning unequally, or by coals casting off more ashes than usual.

Pain felt in limbs formerly broken, or in other injured parts of the body, often forebodes rain. In the summer of 1813, the extens or tendon of my fore-finger was divided by accident; and though by means of a new substance interposed between the divided ends of the tendon, its functions were restored, and the wound completely healed; yet I always feel an uneasy sensation in it before rainy weather, very similar to that which I experience after having much exerted it.

Section V.—*Of Indications of the Return of Fair Weather.*

The absence of those circumstances which forebode or accompany foul weather, may generally be considered as indicating a return of fair. So Virgil mentions the clear and bright appearance of the moon and stars, after they have long been hazy and confused, to indicate approaching serenity. Every one is acquainted with the additional clearness of a night intervening between wet and clear frosty weather. By the general disposition of the clouds, we may, in general, prognosticate fair or rainy weather. In the most settled wea-

ther, only diurnal cumuli appear; they are well defined, increase towards the middle of the day, and decrease at night. The brightness and heat of the fire in winter often indicate frosty and clear weather, as does the lodgment of the moisture on the windows; for it demonstrates a cold and frosty atmosphere abroad. To the above signs of atmospheric changes, many others might be added; but to enumerate all which different authors have mentioned, would swell too much this chapter.

Section VI.—*Of the Prognostics of Seasons.*

The constant desire to know what is about to happen, which our natural curiosity and the interest we take in future events occasion, added to the use which agriculturists and farmers may make of some knowledge of the approaching weather, have always rendered men very attentive to the signs of the seasons; and made them watch attentively for those circumstances from which experience had taught them to anticipate severe winters, hot summers, late springs, plentiful autumns, and other vicissitudes of the year.

Lord Bacon, who was so well calculated to observe and compare facts, collected numerous prognostics of this sort, which are recorded among his works on Natural History. I shall mention a few of these, as subjects for future observation; though, as far as my own experience goes, the cases of exception are nearly as numerous as those which correspond with the rules. According to Bacon, a moist and cool summer bodeth a hard winter; a hot and dry summer and autumn portendeth an open beginning of the winter, and a cold mid-winter and spring; an open and warm winter presag-

eth a hot and dry summer, particularly when there are winter showers.

The earlier or later appearance of birds of passage, is said to correspond with the earlier or later commencement of the seasonable weathers; and to afford thereby a prognostic. But for many years I have observed that this is not precisely the case with the swallow tribe. If it were generally true, it would tend to establish a connexion between the weather of places where the birds come from, and that of those countries whither they go. But when the later appearance of migratory fowls accompanies late seasons, it is probably because the cold unseasonable weather compels them to hide themselves, and prevents their coming abroad and being seen. The occasional early appearance of a single swallow, has been proverbially noticed as not being indicative of summer. *

The abundance of berries in the hedges is said to presage a hard winter; but this often fails.—*Forster's "Researches about Atmospheric Phenomena."*

* It is remarkable, that most countries have a similar proverb relating to the swallow's accidental appearance before its usual time. The Greeks have, Μία χελιδὼν ἔαρ οὐ ποιεῖ; the Latins, *Una hirundo non facit ver;* the French, *Une hirondelle ne fait pas les printems;* the Germans, *Eine schwalhe macht keinen fruling;* the Dutch, *Een swaluw maakt geen zomer;* the Swedes, *En svala gör ingen sommar;* the Spanish, *Una golondrina no hace verano;* the Italians, *Una rondine non fa primavera;* and the English, *One swallow doth not make a summer.*

THE END.

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